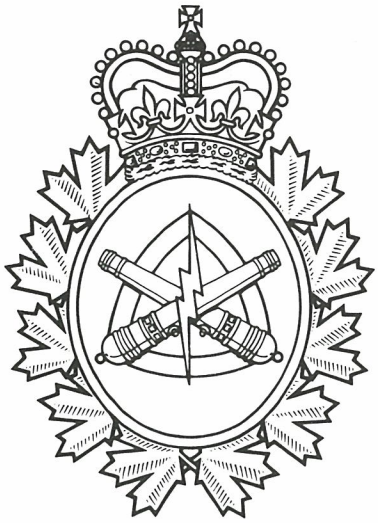
National Defence / Défense nationale

EME JOURNAL

Canada

SPRING 1989



The EME Journal is the magazine of the Land Electrical and Mechanical Engineers, published at NDHQ under the terms of reference of the Director General Land Engineering and Maintenance and the LEME Branch Adviser. The purpose of the publication is to disseminate professional information among members, and exchange opinions, ideas, experience and personnel news, and promote the identity of the LEME Branch.

The EME Journal depends upon its readers for content. Articles on all aspects of the Electrical and Mechanical Engineering System, photographs, cartoons, people news and comments are solicited. Readers are reminded that the Journal is an unclassified and unofficial source of information. The contents do not necessarily represent official DND policy and are not to be quoted as authority for action.

Contributors are asked to submit the original text typewritten, double spaced, paper size as herein. Photos should be sharp, glossy, black and white prints with captions typed separately. Personnel should be identified in all cases, both text and captions, by rank, initials, surname, trade and unit.

Send correspondence to:

National Defence Headquarters
Director Land Engineering Support
Ottawa, Ont.
K1A 0K2

Editor-in-chief — *BGen J.I. Hanson, CD*
Editor — *Col Yves A. St-Laurent, CD*

Associate Editors

FMC	*LCol J.F.J. Forget, CD*	*202 WD*	*LCol J.P.A. Branchaud, CD*
AIRCOM	*LCol P.J. Holt, CD*	*LETE*	*Maj G.J. Koeller, CD*
MARCOM	*Maj J.G. Reade, CD*	*CFSEME*	*LCol R.D. Herbert, CD*
CFTS	*LCol E. Housken, CD*	*Adm(Mat)*	
CFE	*LCol J.A.G. Langlois, CD*	*NDHQ*	*Capt. M. Guilbeault*

IN THIS ISSUE

FEATURES

COMMAND UPDATES

THE CRAFTSMEN'S CORNER

TRADES UPDATE

FROM DGLEM

LAND ENGINEERING TEST ESTABLISHMENT

From the Director General Land Engineering and Maintenance and LEME Branch Adviser

It is hard to believe that two years have passed since I took over the reins as Branch adviser from BGen Rolly Doucet. Those two years have certainly been eventful! The Branch CWO and I have gotten out to see a fair number of you in that time, but there are still some key outposts of the LEME empire we have yet to visit. We hope to get to some of them next year, particularly the West Coast, Bagotville, Cold Lake and Baden. However, our travelling road show has been curtailed somewhat by work pressure here in Fort Tumble on the Rideau.

By the time you read this we should have attained full approval for the Branch brass shoulder titles, and both official language versions are now available from the Branch kit shop at CFSEME Borden. In due course they will also be available from the clothing stores, but this is not likely to happen for over a year, and the free issue is limited to one set.

The hat badge proposal is also working its way through the NDHQ staff system. We are not sure when or if it will get final approval, but remain hopeful. We'll keep you posted on progress.

The Branch continues to be under strength. At the moment we are short about 10% of our establishment in all four of our trades, with the officer ranks also down in the same proportion. The School is working hard to fill the gap, but this means that the TQ4 training load on the workshops will stay at a high level for some time to come. The other side of the coin is that those of you in the workshops are happy with our TQ3 graduates, and those we serve in the bases, stations and field units across the country are equally happy with the support you give them.

The Branch CWO and I look forward to seeing more of you over the next year, so we can play the old game called "poke the finger in the general's chest". You should also be getting more news separately from the School on our plans for the RCEME 50th Anniversary in 1994.

Arte et Marte

Brigadier-General James Irwin Hanson, SBStJ, CD

Brigadier-General J.I. (Jim) Hanson was born in Ottawa on 15 February 1938. He was educated in that city, and holds both a Certificate in Engineering and a Bachelor of Arts Degree in History From Carleton University.

After spending a year as a militia Infantry Officer in the Princess of Wales Own Regiment in Kingston, he joined the Regular Army as a Direct Entry Technologist Officer in September 1962, and was commissioned as a RCEME Second Lieutenant. A period of training at the RCEME School was followed by a posting in December 1963 to 212 Workshop RCEME in Camp Shilo, Manitoba, where he served as Control Officer and was promoted to Lieutenant in May 1964.

He was posted to 4 Field Workshop RCEME in Soest, Germany, in August 1965, and served in that unit successively as OIC Vehicle Platoon, OIC Forward Repair Platoon, Administrative Officer, and Training Officer and OIC Recovery Platoon, being promoted Captain in May 1967. He became one of the founder-members of 4 Service Battalion on its formation in Soest in mid 1968 when he was posted to Battalion Headquarters, and spent the next year there as a member of the Logistics Opertions staff.

Brigadier-General Hanson returned to Canada in July 1969 to attend the Canadian Land Forces Command and Staff Course in Kingston, where he was promoted Major early in 1970. On graduation in July 1970, he was posted to Ottawa where he served a three year tour as a staff officer in NDHQ, his time there being almost equally divided between the Directorate of Ordnance Maintenance and the Directorate General of Bilingualism and Biculturalism. He was posted to Calgary in July 1973, as OC Maintenance Company 1 Service Battalion. He was promoted Lieutenant-Colonel in June 1974 and posted to Lahr, Germany as CO 4 Service Battalion in July of that year.

Brigadier-General Hanson returned to Canada in July 1976 on posting to the Canadian Land Forces Command and Staff College in Kingston as a member of the Directing Staff. After a three year tour at CLFCSC he was promoted Colonel in July 1979 and posted to NDHQ as Director of Land Engineering Support. He was transferred to the Deputy Chief of the Defence Staff Group in August 1981 as Director Operational Program Co-ordination. In July 1982 he moved to CFB Borden to take up the appointment of Commandant of the Canadian Forces School of Aerospace and Ordnance Engineering from July 1982 to January 1985.

Brigadier-General Hanson was promoted to his present rank on 28 January 1985 to assume command of Canadian Forces Base Borden on 1 February 1985.

On 30 July 1987, General Hanson relinquished command of CFB Borden and returned to Ottawa as the Director General Land Engineering and Maintenance.

Colonel William George Svab, CD

Colonel W.G. Svab was born in Waskaw, Saskatchewan on 21 July 1928. He holds a Bachelor of Science (Mechanical Engineering) from University of Saskatchewan.

After spending three years in the Canadian Officer Training Corps, he was commissioned as a RCEME Second Lieutenant in October 1949. A period of training was followed by a posting to 4 Company (RCEME) in Montreal where he served until January 1953, when he was posted to 4 Squadron of the Royal Canadian Lord Strathcona's Horse of the Second Armoured Division, in Edmonton. He participated in the United Nations Forces in Korea with that unit and with 191 Infantry Workshop (RCEME).

When he returned to Canada, he was posted to the Joint Air Training Centre at Rivers, Manitoba, in April 1954, where he served as a parachute test officer and was promoted Captain in October 1954.

After attending the technical staff course at the Royal Military College of Science, Shrivenham, England, Colonel Svab was employed in the Army Development Establishment as a design officer for the Bobcat project and for airborne equipment. In September 1960, he was appointed

Commanding Officer of the LAD of the 4th Regiment Royal Canadian Horse Artillery. Promoted major in December of that year, Col Svab took command of the 2 Field Workshops in Petawawa. He kept this appointment until October 1963 when he was posted to Germany as OC Canadian Detachment, 23 Base Workshop (REME).

In July 1966, Colonel Svab returned to Canada to work in the Directorate of Vehicles and Fields Engineering on the M113 project. In September 1967, he attended the Staff College in Toronto and was posted to the Director of Land Maintenance as a Lieutenant-Colonel in July 1968.

Colonel Svab was posted to CFB Gagetown in July 1971 where he was appointed Commanding Officer, 3 Service Battalion and Base Technical Services Officer. He was promoted Colonel in June 1973 and was appointed Deputy Base Commander, CFB Gagetown.

In July 1973, Colonel Svab was appointed as Commanding Officer, 202 Workshop Depot in Montréal. After a three-year tour at 202 Workshop Depot, Colonel Svab returned to Ottawa in August 1976 as Director Program Co-ordination. In July 1977 he was nominated Canadian Forces Attaché, Pakistan and Afghanistan and kept the same appointment for Norway, Sweden and Denmark in July 1978.

In September 1980 Colonel Svab was appointed Director Combat Mobility Engineering and Maintenance until he retired in February 1982 to start a second carreer as a Public Servant in the Directorate Support Vehicle Engineering and Maintenance. Colonel Svab has retired in November 1985 and was appointed Colonel Commandant of the LEME Branch in July 1987.

Chief Warrant Officer Joseph Edward Yvon Ronald Roy, CD

Chief Warrant Officer J.E.Y.R. (Ron) Roy was born in Kirkland Lake, Ontario on 20 June 1946.

He served with the Algonquin Regiment for a year in 1962 and then joined the Regular Force on 11 June 1963 as a RCEME Soldier Apprentice in Kingston, Ontario. He graduated and was posted to 8 Company RCEME in Petawawa in July 1965. He served as a craftsman vehicle technician until appointed Lance-Corporal in August 1966 and was then posted in November to the 8th Canadian Hussars (Princess Louise's) in Petawawa. In March 1967 he was posted to 1 Transport Company Maintenance Platoon in Soest, West Germany. He was promoted to Corporal on 11 June 1967 and served with that unit until May 1968.

His five year engagement expired in June 1968 and after a brief period of time as a civilian mechanic he re-enrolled in October 1968. He was posted back to Germany as a member of 4 Supply and Transport Company and was psoted in May 1970 to 2 Service Battalion Maintenance Company in Petawawa. He was appointed to Master-Corporal in October 1972 and was then posted to 1 Canadian Light Field Hospital in June 1973.

In January 1974, after six months with the Field Hospital he was posted as an instructor to the Canadian Forces School of Aerospace and Ordnance Engineering in Borden. In April 1974, he was promoted to the rank of Sergeant and instructed until July 1977 when he was promoted to the rank of Warrant Officer and assumed the duties of the Company Sergeant-Major of Vehicle Company. He served in that capacity until 1979 when he returned to instructional duties.

In January 1980, he was posted to PCOR LORE, at NDHQ in Ottawa, as a Vehicle Technician Career Manager. In July 1980, he was promoted to Master Warrant Officer and then in July 1982 he was promoted to Chief Warrant Officer and continued to serve in the Career Office until July 1983 when he was posted to 2 Service Battalion in Petawawa as the Engineering Technician Sergeant-Major of Maintenance Company.

He was posted to Ottawa, to the Land Engineering Test Establishment in August 1986 as Engineering Support Officer and Assumed the duties of Regimental Sergeant-Major in October 1987.

On 11 April 1988, he was appointed as the Land Electrical and Mechanical Engineering Branch Chief Warrant Officer in the Director General Land Engineering and Maintenance Division in Ottawa.

He is married to the former Dawn Prescott of Pembroke, Ontario and has two children, Christine and Nicole.

LEME Association President's Message

Our 43rd annual general meeting held last October at CFB Borden presented the opportunity for representatives of all the LEME Chapters, various Militia LEME units and regular force LEME personnel to meet, exchange information and discuss matters affecting our Branch. This is a forum that has existed since the original RCEME Corps Association was formed in 1945. The LEME Association perpetuates the aims of the original association by providing advice to the government through our membership in the Conference of Defence Associations, assistance to units and help and mutual camaraderie amongst our members.

As a result of the Defence White Paper and its direction that the Canadian Forces will move towards a "Total Force" concept, the Association, as constituted, is well equipped and prepared to assist the Branch as may be required. The Association can provide another avenue of communication between regular and reserve forces from coast to coast. It can also direct matters of concern and represent the interest of the Branch to senior commands or the government through position papers and resolutions via our membership in the Conference of Defence Associations.

Geographically, the Association is represented from Victoria to Halifax through 9 local chapters, the various Militia Service Batallions in all provinces and a number of members at large from both the regular and reserve forces. All retired or active RCOC(E)/RCEME/LORE/LEME officers are encouraged to become members of the Association and participate through local chapters or directly to enhance the well-being of the Branch.

In an era when change demands change, communication and team work are essential. The LEME Association, as one of the LEME Institutions, welcomes the challenge to become a more active member of the team and offers our services in support of the welfare and effectiveness of the LEME Branch.

ARTE ET MARTE

Air Command Update

A number of interesting changes have taken place in the Air Command EME world recently. To start with, our name in this Command is now EME, not Land Maintenance. This means that the SSO at Command is SSO EME, our Workshop Commanders are Base or Station EME officers and so on. The reason for this change is quite clear; the Aircraft Maintenance organization is more than ten times our size in Air Command, and has a well-established claim to the term "maintenance". As well, it was determined during the recently concluded Air Command Land Maintenance Functional Review that much of the confusion surrounding our role here in the Command stemmed from the name itself! Since the change of name in June of 87, the

Lcol Holt and MCpl S. Rapp investigate the failure on a FEL.

EME presence on air bases had become recognized as "an essential element contributing significantly to the operational objectives of Air Command" (quoted from the Functional Review report).

Some other important changes took place at a number of the 18 bases across the Command. In Bagotville, Cold Lake, Comox and North Bay, the EME organizations attained full section status, with Captains being posted in to take-over the latter two workshops. Previously, all four had been subsections of Base Transportation, as was the custom in the days of the pre-Integration RCAF. At Goose Bay, 1 April 1988 marked the transition from radar station to support base for Allied low-level flying training, and the seven men vehicle maintenance subsection was transformed into an EME workshop of 38, commanded by Captain Bill Fleming. This was largely done by transferring positions from Transport Canada to DND, and further growth of 13 to 16 is anticipated 1 April 1989, when Public Works Canada relinquishes their operations at Goose Bay to DND. The EME section may grow yet again in 1990, if NATO decides to formally establish its major low-level flying training centre there.

On the opposite side of the coin, 1988 marked the last of the Cadin-Pinetree radar station closures. Only four stations remain of the original 22. EME organizations on stations were and are quite small, on the order of four to seven Veh Tech 411's headed by a Sgt. For those who are interested, the remaining stations are CFS Holberg (Vancouver Island), Mont Apica (north of Quebec City), Sydney (Cape Breton) and Barrington (Nova Scotia).

Returning to the theme of growth, one of the major challenges to face all of us in the coming years is the expansion of the Reserves. As Air Command presently supports considerably more Militia than FMC (45 percent vs 32 percent), not to mention the majority of Canada's Air, Communications and Naval Reserve units, Reserve expansion will obviously have a large impact on us. A little-known fact about Air Command, however, is the existence of Air Reserve Augmentation Flights (ARAF) on all air bases. These are used as the name suggests, to augment sections that need extra manpower. Some BEME sections are already taking advantage of ARAF assistance, and it is our intention to expand this employment of Reservists in order to meet future increases in workload.

In summary, EME in Air Command has come of age. Much has been accomplished these past few years to define our place in the "Air Force" scheme of things, and we are now ready to uphold our long tradition of providing the best possible service to our customers – whether in light blue, dark blue or brown!

ARTE ET MARTE/SIC ITUR AD ASTRA

EME Section
Maritime Command Headquarters

INTRODUCTION

The EME section of Maritime Command Headquarters has the responsibility to advise the Commander on all matters relating to the Land Maintenance System, to interpret and implement NDHQ EME policy and to ensure that EME sections at Bases and Stations are operating in accordance with this policy and providing efficient and timely maintenance support to the Navy.

STAFFING

1988 saw a number of changes to the section. Major Bruce Jeffery was posted to CFB Chatham and Major John Reade arrived in March from RMCS in Shrivenham, England. Shortly thereafter all the hard work substantiating and ECP came to fruition with the arrival of the new SO EME, Capt Lisa Moulton from CFB Halifax BEME Section.

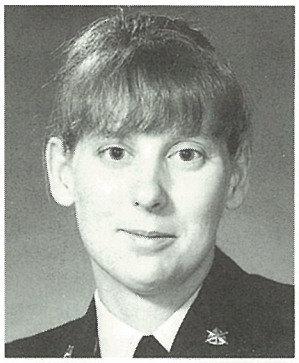
Concurrent with the arrival of Capt Moulton was the addition of the ionization radiation safety function for MARCOM to DCOS Log and the EME Section. The impending delivery of depleted uranium ammunition to the Navy, the possibility of nuclear powered submarines and the myriad of other radioactive sources in naval equipment has generated the need for a Radiation Safety Officer on board fighting ships and AORs and in areas where ammunition is handled and stored. The identification of the training requirements for RADSOs, compiling inventories of radioactive materials and writing her own statement of duties as Command RADSO has kept Capt Moulton very busy.

GEOGRAPHY

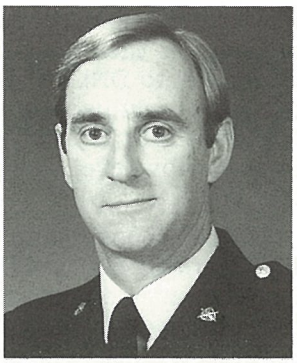
At this stage it may be useful to indicate the area of responsibility of the MARCOM EME staff. EME personnel are employed in the following areas:

EAST	WEST
CFB Halifax	CFB Esquimalt
CFB Moncton	CFS Aldergrove
CFS St John's	CFB Nanaimo
CFS Mill Cove	CFS Rocky Point
CFS Sydney	
CFS Debert	
CFS Bermuda	

CWO R. Colburn
EME 2
Veh Maint



Capt. L. Moulton
SO EME
FCS/WPNS/RADSO



Major J.G. Reade
SSO EME

and MARCOM provides support to other Commands as follows:

a. FMC	1	Base
	1	Regular Force Unit
	37	Reserve Units
b. AIRCOM	5	Bases
	3	Stations
	7	Reserve Units
c. CFCC	2	Stations
d. CFTS	2	Bases
	1	Militia Unit
e. NDHQ	167	Cadet Units

ACTIVITIES

1988 has been an extremely busy year for the EME Branch in MARCOM. Internally, we have been learning and implementing the procedures of MMMS and externally a great deal of effort has gone into an expanded inspection schedule with great emphasis on promoting awareness of EME expertise at the technical level and staff assistance from the officers and senior NCMs on all problems of land technical equipment support to our customers. The establishment of more cooperative working relationships at the Logistics/EME interface is showing excellent results and good leadership by Major Gary Ross at EME workshop Halifax and Captain Geoff McClelland at EME Workshop Esquimalt is resulting in efficient use of resources and manpower.

Completed to date, is the new staff inspection checklist and the establishment of a Weapon Technician Land position in St John's Newfoundland. In the works is a new Maritime Command Order (MARCORD) to define the Land Maintenance System and to explain its capabilities and how to demand support.

THE FUTURE

Sitting in the shadow of the MacDonald bridge and watching the fighting ships going to sea, it is all too easy to forget the vast amount of activity that the Branch devotes to equipment management and new projects for equipment used by the other Commands. To bring MARCOM personnel up-to-date on this activity, a working group will be held in February 1989 in Halifax. The MARCOM contribution to the next issue of the EME journal will concentrate on the proceedings of the conference.

An EME Officer With Communication Command

by Captain C. Turmel, SO Maint L, CFCCHQ

In January 1988, the first EME Officer joined Communication Command Headquarters as Staff Officer Maintenance Land (SO Maint L).

To help you understand where my position belongs into Communication Command Headquarters, figure 1 shows the organization chart of the Headquarters. Since there is a plan for reorganization at this HQ, for the moment my position is part of the Comptroller Branch and under the Senior Staff Officer Logistics.

One of the first tasks was to write my statement of duties. But how to write a statement of duties without knowing Communication Command? The organization of Communication Command consists of:

a. the Canadian Forces Supplementary Radio System which includes units like CFS Masset, CFS Alert, CFS Bermuda, CFS Leitrim and Communication Research Squadron (Comm Rsch SQN) Gander and Ottawa; and
b. the Communication Groups which include:
   (1) Communication Reserve Units ranging from Communication Troops, Squadrons and Regiments scattered throughout Canada,
   (2) Major Regular Force units like CFS Debert, CFS Carp and 1 Line Troop, and

(3) Regular Force Communication Squadrons and Detachments scattered across Canada.

As you may have deducted from the above, most units are lodger units and supported by Canadian Forces Bases across Canada except CFS Masset. In light of this information, emphasis was given to support CFS Masset, CFS Alert, 1 Line Troop and all reserve units across Canada. Since CFS Debert and CFS Bermuda may obtain their own vehicle technicians, in the near future, more support will be provided to them.

With all these facts, I was able to produce a statement of duties. In short, my responsibilities are to provide policy guidance to CFCC Regular and Reserve Units and Supplementary Radio System (SRS) stations on land maintenance matters, and liaise with all land maintenance agencies. My detailed responsabilities are listed at Figure 2.

With a statement of duties and knowing more about Communication Command, I started to install myself. Different files on maintenance matters were revised and opened. About six hundred (600) technical publications were ordered, received and properly stored on shelves. Different reports were obtained from NDHQ/DLES and inspection/assistance visit were started. I have visited so far: CFS Masset, 1 Line Troop (Kingston), CFS Carp, CFS Alert and the Reserve Units of 71 Comm Gp St Hubert, 73 Comm Gp Winnipeg, 70 Comm Gp Trenton and all Base Maintenance and Base Telecom Officers that support those units.

The visit of the units has provided more knowledge of this command and permitted to see what kind of support they require. For example, the requirement of one additional vehicle technician at CFS Masset was identified and supporting data was provided to the Commanding Officer for the submission of an Establishment Change Proposal (ECP). It has permitted to identify major problems at CFS Alert ranging from lack of specialized tools, additional requirement of personnel during summer operation, new facility requirements and more. The visit to the Reserve Units has permitted to identify major problems with veh tech and rad tech reserve training, their duties, the lack of tools, improper facilities to do their work, their lack of readiness for field operations and more. It has also provided the opportunity to meet with the B Maint O and B Tel O of the supporting Base and discuss the support to these units, and permitted to explain to them the differences between the militia units and the reserve Communication units.

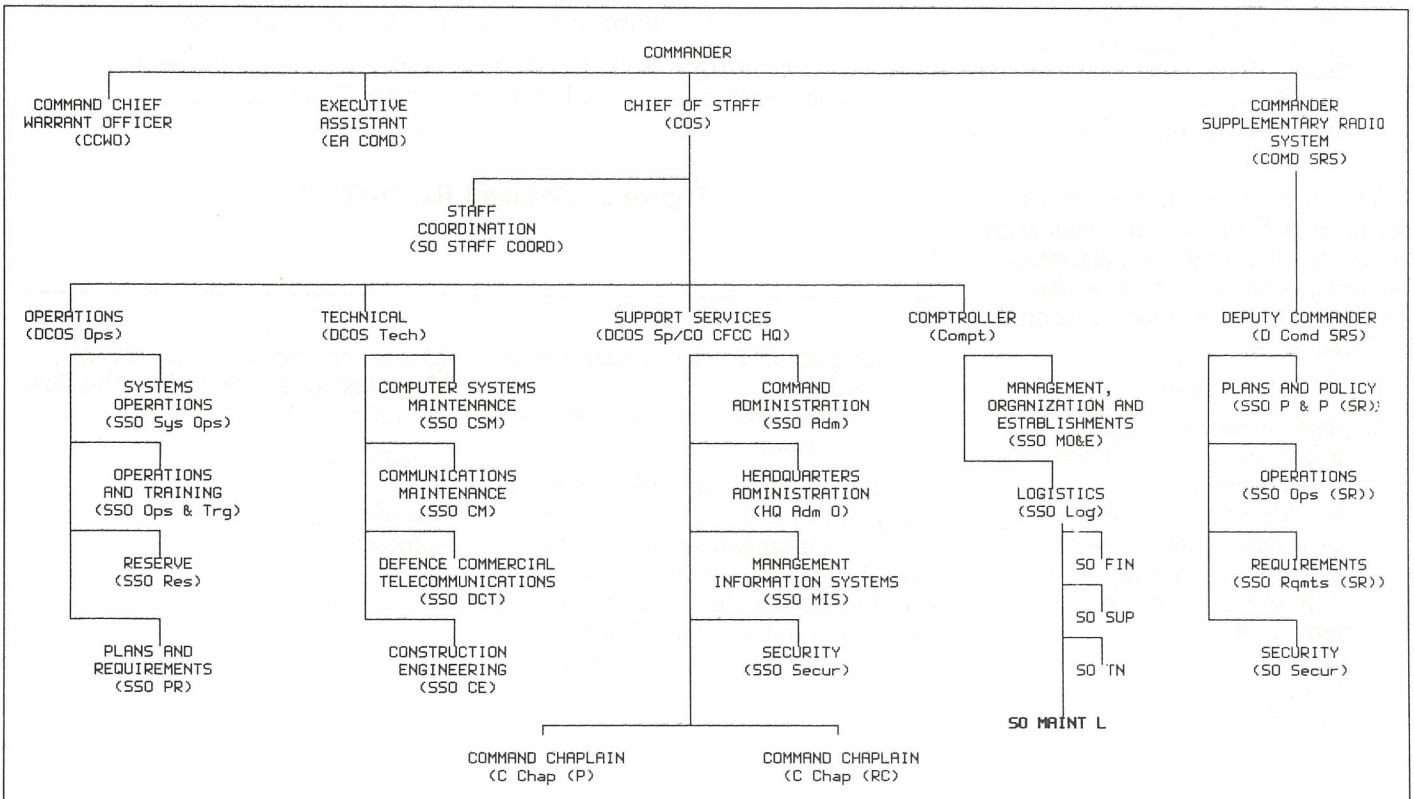


Figure 1 ORGANIZATION CHART OF COMMUNICATION COMMAND HEADQUARTERS

An EME Officer With Communication Command

Before my arrival with Communication Command, maintenance matters concerning vehicles, generators and weapons were sent directly to NDHQ. All routine and short term problems were solved by NDHQ but nothing was done to improve maintenance on a long term basis. With my arrival, a lot of problems that used to go to NDHQ or other commands, are now solved within this command. For example, a lot of CFS Alert problems used to go to CFB Trenton and Aircom HQ, now most of those problems are solved between CFB Trenton/B Maint and CFCC HQ/SO Maint L while keeping Aircom HQ informed. Since the beginning, a very good relationship has been built with CFB Trenton/B Maint which has improved the support to CFS Alert.

For the future, I have for short term goals to:

a. produce a Statement Of Requirements (SOR) for the Mobile Support Equipment (MSE) facilities of CFS Alert;
b. visit the Reserve Units of 76 Comm Gp Ottawa, 74 Comm Gp Vancouver and 72 Comm Gp Halifax, and CFS Debert before the end of fiscal year 88/89; and
c. visit CFS Bermuda during fiscal year 89/90.

The visit of CFS Debert and CFS Bermuda will permit the evaluation of the requirements of personnel, facilities, tools, etc.. before the transfer of maintenance personnel to these units.

For long-term goals, I want to:

a. produce maintenance policies and directives for Communication Command;
b. provide to reserve units long term objectives to meet;
c. look at the training of veh tech and rad tech reserve personnel;
d. continue yearly inspections at CFS Masset, 1 Line Troop, CFS Carp, CFS Debert and CFS Bermuda;
e. inspect CFS Alert twice a year; and
f. visit reserve units once every two years.

My detailed responsibilities are:

1. Interpreting NDHQ land maintenance policy, formulating and directing the implementation of CFCC land maintenance policy and procedures;
2. Performing Annual Land Maintenance Inspection/ assistance Visits of CFSRS stations, Communication reserve Units and major Communication Regular Units of CFCC;
3. Processing all incoming and outgoing land maintenance correspondance including processing of Provisional Condemnation Certificates (PCC), Unsatisfactory Condition Reports (UCRs), Technical Failure Reports (TFRs) and Attrition Warning Reports (AWRs);
4. Preparing written reports of inspection/assistance visits and ensuring necessary follow-up is completed;
5. Drafting and approving all CFCC land maintenance policy papers and instructions prior to dissemination to CFSRS stations and to Communication Reserve and Regular Units;
6. Maintaining a technical library pertinent to the equipment used in CFCC;
7. Acting as senior representative for CFCC/CFSRS units in land maintenance policy discussions; and
8. Ensuring senior staffs are kept abreast of current land maintenance policies and related procedures.

Figure 2 Detailed Responsibilities

It is very hard to explain and say everything I did since my arrival with Communication Command. One thing is sure, this command may be the smallest compared to the others but its field of action is clearly more vast: to the North (Alert), to the South (Bermuda), to the West (Masset) and to the East (St John's NFLD).

Arte et Marte.

Claude Turmel
Captain
SO Maint L
CFCC HQ

LEME in Mobile Command

Part 1

Comments by SSO Maint, LCol J.F.J. Forget

Within the past few years, the LEME branch has been going through a number of changes that have translated into better and more efficient support to the users. As we are revitalizing the EME journal, I welcome the opportunity for FMC to provide a series of articles on the LEME presence and actions within FMC. Maintainers have always been known for their ingenuity and we have seen many examples of that especially during field exercises such as the RV series, MILCONS and formation exercises. This ingenuity will become an important ally as we are embarking on the very challenging road to implement the White Paper on Defence.

As we are preparing for the Army 2002, we still have to maintain our current commitments and ensure that a workable transition plan is developed and implemented. This is, to say the least, a very interesting challenge for our maintainers at all levels. In all this effervescence, we should never loose sight of the aim, which is to provide a responsive maintenance support system that meets the training and operational requirements of FMC.

To face this challenge, FMC has an establishment of over 2200 maintainers including 311 CELE tradesperson of which 116 are in second line workshops. In fact, most maintainers will serve in FMC at some point in their career since 42% of all LEME positions are in FMC: 20% of LEME officers, 45% of vehicle technicians, 48% of Weapons technicians (land), 39% of Fire Control System technicians and 43% of Material technicians. In addition, the LEME Militia has grown over the past years to a total of 853.

In the series of articles to be published in this bulletin and the next two bulletins, we will attempt to give you a feel for the major activities and challenges going on within the command. In this bulletin, Capt Ron Landry will provide an update on the status of the LEME Militia, and Maj Bob Tramer will cover the initial developments of Army 2002 and the projected impact on the LEME branch. The EME Journal 1/89 will carry on with FMC update part 2 and with an article on the preparations for Exercise RENDEZ-VOUS 89 – Maintenance Battalion. Finally, edition 2/89 will focus on exercise RENDEZ-VOUS 89.

In closing, I believe the LEME branch and especially LEME personnel within FMC, be they Militia or regular force, will face a most challenging evolution over the next 14 years. I am sure that as we have done in the past, our maintainers will continue to show their craftsmanship and ingenuity and rise to the challenge.

Status of the LEME Militia

By Capt Ron Landry, S03 Maint Militia, FMCHQ

The LEME Militia strength has risen imperceptibly over the past few years to reach the present total of 853 all ranks. The bulk of LEME Militia Personnel is concentrated in Service Battalions. There are a total of twenty battalions throughout Canada from St John's, Nfld to Victoria, BC:

a. Service Battalions – total 20 Maint Coys –
   (1) Officers 61
   (2) NCMs 490
b. Others – total 111 units –
   (1) Officers 19
   (2) NCMs 283
c. Totals Coy/Unit – 131
   (1) Officers 80
   (2) NCMs 773

The 1988 Militia Service Battalion competition has provided a good insight on the status of the LEME Militia. As a result of these competitions, the William-Lennox Thompson trophy is awarded to the best Militia Maintenance Company. This year, the trophy was awarded to the Maintenance Company of 33 (Halifax) Service Battalion. The competition is based on such factors as the quality of training and maximum utilization of available resources.

On the training side, in 1985, we saw the introduction of Militia Individual Training and Career Profile (MITCP 85) which is now the umbrella programme for all training in the Militia. MITCP 85 has the mandate to train the Militia to mobilization specifications. Under MITCP 85, a limited number of mobilization sub-classifications and sub-occupations are being developed. From the three LEME officer sub-classifications, one was adopted and from the 29 mobilization sub-trades, 12 were adopted to meet the requirements. They include the following:

M43B	LEME Officer
M411A	Vehicle Technician – Wheeled
M411C	Vehicle Technician – Engineering Equipment
M411E	Vehicle Technician – Recovery
M421A	Weapons Technician Land – Small Arms
M421B	Weapons Technician Land – Artillery
M421C	Weapons Technician Land – AFV
M431A	Electro Mechanical Technician – General

M431B Electro Mechanical Technician – Automotive
M432A Fire Control Technician (Electronic) General
M433A Fire Control Technician (Optronic) Optical
M441A Material Technician – Welder
M441F Materiel Technician Textile

We are still in the early stages of transition from present state to MITCP 85 state, and the transition period will probably be a fairly long one. As the establishments of Army 2002 are being developed, they will show the positions allocated to the Militia and we will be able to finalize the requirements. Although the number of Militia positions are expected to increase by 250%, it is not anticipated to have more than the 12 sub-occupations opening under MITCP 85. The remaining sub-occupations would open in wartime.

As you undoubtedly realize, a substantial amount of work remains to be completed before we can seriously start training the Militia to mobilization specifications. The main obstacle is training time which is limited to about 40 training days per year. A number of potential solutions are being addressed. They include such things as:

a. an equivalency program for candidates with previous civilian training;
b. a further division of sub-occupations into sub-sub-occupations;
c. enrolment of ex-regular force members which already have trade qualifications; and
d. video programmes and correspondence training similar to ILTIS and MLVW conversion training pakages.

The Militia has not yet started to train under mobilization specifications, but yet some very valuable training is still going on under the present system. 1987 marked a turning point in this training with the formation of the Electrical and Mechanical Engineering Reserves School (EMERS), a National Rank Qualifying School (NRQS) for the militia officers and tradesmen of the LEME branch. From a command and control point of view, EMERS is treated the same as other companies within CFSEME. The major structural difference is that EMERS is decentralized, with its platoons paired off with a parent CFSEME company for support. The CFSEME training companies provide all the necessary resources and guidance to allow EMERS personnel to get on with their training.

The concept of EMERS and its aims have been well established in its first year of operation at CFSEME. To improve the EME Militia training and provide Franco student equal opportunity it was decided to expand EMERS to include ETFC St Jean. It was agreed that EME Militia training conducted at ETFC would be done as part of the EMERS programme.

EMERS CFSEME and ETFC have graduated to date a total of 236 students all ranks a tremendous success. The training calendar for 1989 is to conduct a total of twenty three courses at CFSEME EMERS and eight courses at ETFC St Jean a 100% increase at ETFC from 1988.

The future looks particularly challenging for the LEME Militia. In order to meet the requirements of Army 2002, our Militia strength will have to increase at almost 10% per year over the next 14 years. Therefore the training output will have to increase substantially and new methods and approach to training will be required. The present status of the Militia provides us with a fairly solid base upon which to expand to meet the future requirements. However, we have quite a challenge ahead of us in developing an adequate training structure capable of meeting our future requirements. Every possible source of training must now be analyzed in order to develop a solid LEME Militia that can meet the requirements of Army 2002.

LEME in Army 2002

By Major C.R. Tramer, S02 Maint Tech Sp, FMCHQ

INTRODUCTION

Most people by now are aware that the Defence White Paper will have enormous long term effects on the Canadian Armed Forces in general, the Army even more so and LEME in particular. Just how these effects will be felt is not yet clearly understood but we can now give you some idea in broad terms of what is on the way.

Because there are some constraints on accuracy, we will not provide any numbers beyond generalities. Some of the constraints include a lack of knowledge of equipment types (which tank?), doubt concerning facilities (which bases?), and what the peace establishment will look like.

We do have a pretty good feel for the overall plan and it is the part that LEME will play in the 'Big Picture' that will be discussed here. That big picture is made up of the Allied Command Europe Division (ACE DIV), Task Force (TF) for Defence of Canada Operations (DCO), Readiness Forces and the Command and Support Structure. Each will now be discussed briefly.

ACE DIV

There are four second line maintenance organizations to be found in ACE DIV. The first is the Maint Pl of the National Support Element (NSE), which should be familiar to most. NSE provides the peculiar-to-Canada support for the AMF(L) Bn Gp and during operations it fits into a British Log Support Bn. The second is the Maint Bn of DISGP, which probably isn't familiar yet, but will be after RV89. At least it will be for those who have the pleasure of participating. Finally, there is a Maint Coy in

each of the DISGP svc bns. To put things into perspective, LEME in NSE will consist of 18 NCMs and two officers, while the DISGP including the maintenance battalion and both service battalion maintenance companies will employ 60 LEME officers and almost 1000 LME NCMs.

The DISGP will be organized into functional battalions of Supply, Transport and Maintenance, a Finance and a Dental Company, and two DISGP Svc Bns. Keep in mind that all of this is still second line support. Unlike what we know today there is something behind the service battalion to provide backup. That something is the Maintenance Battalion of DISGP and it too provides second line support. We don't find third line until we cross the Div Rear boundary, but that's a topic for another time and place.

Third and fourth line maintenance organizations will also be found in Europe. Though not part of the Division, they will support both the ACE DIV and the Air Division. Third line will be provided by the Canadian Support Group (Europe) (CSG (E)) and fourth line will be the responsibility of Theatre Base. LEME contribution once again will be significant with people numbers in the range of 50/500 and 25/75 respectively. The disparity in officer to NCM ratio for CSG(E) is understandable when the type of service to be provided is taken into account.

TF DCO

Service Support to the TF is quite different from ACE DIV. For starters there is no fourth line. The TF will be operating in Canada and current command structures, base support and the Canadian Industrial base are seen as adequate. As well, the TF is to be organized into Brigade Groups, rather than Brigades as in ACE DIV, and therefore second line support takes the form of Brigade Group Service Battalions. LEME troops would number about 550 with 20 officers, in each of two such battalions.

Two more second line organizations are needed to support the TF and those are the Direct Support Unit (DSU) and the Airborne Service Commando (AB Svc Cdo). The DSU supports the TF Troops. It is made up of 400 folks, of which about 60 all ranks will be LEME. The AB Svc Cdo provides both first and second line support to the AB Regt and second line to anyone else attached to the Battle Group. To accomplish this will require a considerably stronger AB Svc Cdo and the LEME slice is about 70 NCMs and five officers.

Third line support to the TF will be the job of the Canadian Support Group (Canada) (CSG(CA)). This organization would probably be used to augment any base that was supporting a TF operation. It will be just under 600 strong with LEME making up 140 of that number.

READINESS FORCES

The READINESS FORCES consist of three Brigade Groups structured primarily to provide replacements for ACE DIV. There will be a small service battalion for each of them. As they will have little equipment, it can be appreciated why LEME strength in total for all three is something less than 850 all ranks. These three Svc Bns will be too small to provide adequate support to fully equipped Bde Gps.

COMMAND AND SUPPORT STRUCTURE

Included in this category are all of the training establishments, all of the Headquarters and all of the bases. New training establishments such as the Militia Training and Support Centres, new Headquarters such as Areas and Districts, and new bases such as Aldershot Dundurn, Meaford and possibly Chatham are all in the works. The known LEME bill so far approaches 100 officers and 1500 NCMs.

LEME MILITIA-REGULAR FORCE RATIOS

ORGANIZATION (a)		REGULAR FORCE (b)	PRIMARY RES (c)	SUP RESERVE (d)
(1) ACE DIV	(a) DISGP	70%	30%	
	(b) CSG (E)	25%	75%	
	(c) Theatre Base	28%	38%	34%
(2) TF DCO	(a) Svc Bn "X"	60%	40%	
	(b) Svc Bn "Y"	10%	90%	
	(c) DSU	30%	70%	
	(d) AB Svc Cdo	85%	15%	
	(e) CSG (CA)	59%	41%	
(3) Readiness Forces	(a) Svc Bn	49%	51%	
	(b) Svc Bn	10%	90%	
	(c) Svc Bn	10%	90%	
(4) Comd & Sp (Bases)	(a) 2002 Army Bases	16%	34%	50%

THE RESOURCES

If you have been doing your sums it will quickly become apparent that, as one LEME Commanding Officer was quoted in a national magazine as saying 'the blanket just isn't big enough to fit the bed'. Just where are all these warm bodies going to come from, and well may you ask. The answer, of course, is the Militia!

While the regular force will see substantial increases over the next ten to fifteen years, the Militia will experience phenomenal growth. Without boring you with numbers (we hope), here are some percentage comparisons between regular and militia figures that will be needed to accomplish the tasks that we have been given. Regular LEME Technicians will have a healthy increase of 25% by 2002 but Militia Techs will increase 251%. Similarly, regular LEME officers will experience a 19% growth in numbers during the same period but LEME Militia officers will increase by 142%.

Those of you quick with a calculator will see that regular force numbers are no where near sufficient, and that's where Total Force comes into play. Only NSE will have totally regular force LEME people. All other service support organizations will contain a mix of regular force LEME people. All other service support organizations will contain a mix of regular and militia technicians and officers. The table below provides a few examples.

Painfully obvious by now is the fact that there are problems associated with training, facilities and the whole way in which we do business. Elsewhere in this issue an update on Militia training was addressed. Still to be resolved, however, are many other problem areas. Discussions of those must wait, unfortunately, until plans are more fully developed.

CONCLUSION

There are interesting times ahead for all of us. Army 2002 probably represents the biggest challenge that LEME has faced since World War II. New organizations, using new equipment, operating in new environments with new concepts will keep all of us busier than we have ever been before. Just when we thought everything was old hat along comes the most exciting venture imaginable.

This overview of the part LEME is to play in Army 2002 is only intended to provide a general feel for where we are going. Once again the caution must be made that numbers are approximate and organizations are tentative. Real world concerns such as equipment types, equipment quantities, defence budgets and nuclear submarines will all have an impact on what the final version will be.

The Craftmen's Corner

12 May 1994

A Date to Remember

by Maj A. Thibert

The year 1994 will mark the 50th anniversary of the forming of the Corps of Royal Canadian Electrical and Mechanical Engineers. Although 1994 seems a long way in the future, time passes quickly. To ensure that the 50th anniversary of RCEME will be a memorable one for all past and serving members of the Branch, a number of events have been planned during that year. To this end, National and Regional Committees are being established to form the necessary structures to plan and coordinate all aspects of these celebrations.

The Branch Advisor Newsletter 1/88, dated June 88 (forwarded to all LEME personnel), outlined the general concept of the 50th anniversary celebrations. CFSEME, as the agency responsible for coordinating the raising of national funds, is in the process of designing a number of schemes. These are aimed at obtaining funds, by imposing as small a burden as possible on all members of the Branch.

To publicize these fund raising activities and outline the various schemes devised, an "EME 50th ANNIVERSARY NEWSLETTER" will be published on a regular basis. This periodical will originate from CFSEME and will feature 50th anniversary happenings only. In all, approximately $250,000 will be needed to fund a national memorial and support other national initiatives. The first edition is expected to be issued early in 1989.

One of the national highlights of 1994 will be the unveiling of a memorial at the LEME School in Borden. Design submissions are presently being accepted by various artists to determine what this memorial will look like, how much it will cost and which artist will produce it. Most assuredly, the focal point of this memorial will be related to RCEME and its historical badge.

This project is by no means a small venture. A large amount of capital will be required to fund the research and development of the design. It is estimated that roughly $200,000 will be needed to fund a memorial worthy of our history. This is why various fund raising activities are being conceived to support this project on a national scale.

A great deal of the assistance for the memorial will come directly

from donations by retired and serving Branch personnel. With this in mind, negotiations were initiated with Revenue Canada, in order to obtain a Charitable Organization status, so that those making donations to the 50th Anniversary Trust Fund would be able to use their receipts for tax exemption purposes. Confirmation of this status was received in November 1988, and donations wil be accepted at the School by the Treasurer of the Trust Fund.

Cheques made out to the "50th ANNIVERSARY TRUST FUND" can be mailed to OC Headquarters & Standards Company. Upon receipt of a contribution, an official receipt will be issued to acknowledge the donation as well as provide the necessary documentation required for income tax purposes.

The initial fund raising project, now being planned, is "The Great 1989 Car Raffle." On 29 June 1989, at CFSEME, the first of five annual car draws, will take place. This raffle will, in fact, consist of three prizes. The main prize being offered will be a 1989 mid-size sedan car.

In addition, two other valuable prizes will be offered – a Macintosh computer and a colour TV. Complete details of these prizes will be published when tickets go on sale early in 1989.

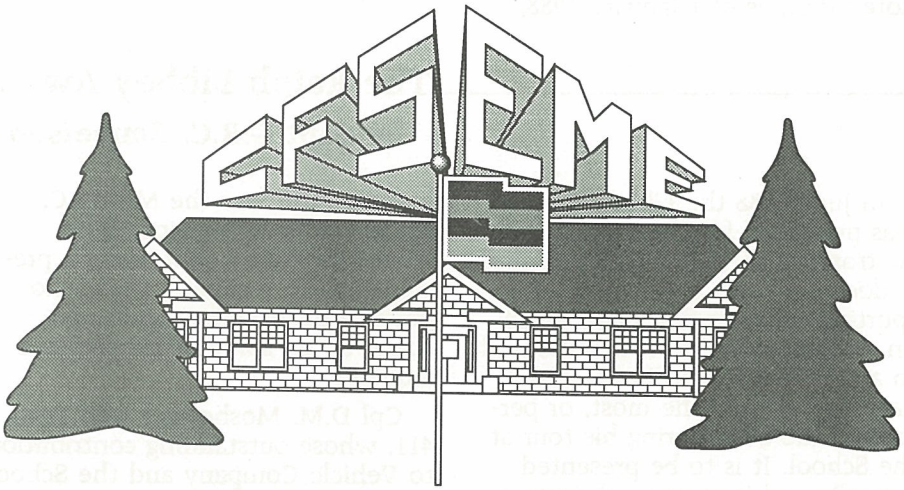
The raffle tickets will be offered at a cost of *two* dollars each, three for five dollars or seven for ten dollars. Ticket sales will not be restricted to LEME personnel. Each ticket sold between January 1989 and 9 June 1989 will be tracked on a database at CFSEME.

The schemes outlined so far will not be sufficient to completely satisfy the requirement for funds. Consequently, EME units or sections, will be asked to contribute to the 50th Anniversary Fund by donating the net profit of *one* event organized by that unit or section, each and every year, leading to our 50th, starting in 1989. This may be a pool, raffle, draw, sports day, Bonspiel, or whatever. It is expected that, as a minimum, every EME unit or section will be able to contribute at least two dollars, per year, per Branch member on unit strength. The success of "CELEBRATION 1994" depends on each and every person – join this historic celebration and pledge your support.

School HQ and Logo

by Capt G.R.C. Emmerson

One may recall an article and photographs in the last EME Journal dealing with the opening of the new Headquarters. Well, out of those photographs a new School Logo has evolved. Utilizing state of the art resources recently provided to the School, and with a bit of local talent in the form of Maj A. Thibert, presto! ... a computer-generated School Logo. At the press of a button, it can instantly be incorporated into slides, OHPs, or letterhead for public relations submissions.



The logo focuses on the distinct features of the HQ building, which sits at the entrance to CFSEME lines. Although it was not designed to assist in finding one's way to CFSEME HQ, it could certainly prove useful in this regard. Any lost souls who are at the point of panic need only match the logo to the building and they are there.

The building itself (A-72) has slowly begun to take on the appearance of a School HQ. Members of the HQ staff have been moving walls, painting, making trophy cabinets, and a number of other self-help projects.

By the time this is in print, it is hoped that all new windows will have been fitted and the front entrance will have been finished. Already, two trophy cabinets have been made by the staff; but the decor which surrounds them is still lacking. One of the trophy cabinets is the new place-of-honour for "Sadie", who has finally come home; but that's the subject of another story. Suffice it to say that when all the renovations are finished, LEME people walking into the building will know they are at the home of the Branch, with its ties to the past and spirit of the present.

QL7 Course

by Maj D.T. Tiller

The QL7 Course was developed based on the requirements identified when the Occupation Specification was amended in November 1985. Preparations for the course commenced in early September 1986 with the rationalization of course content, administrative details, development of teaching points and interrelationship of performance objectives.

A pilot course, with 16 Warrant Officers, was conducted from March to May 1987. Since its successful conclusion there have been three additional courses in 1988, graduating 57 Warrant Officers. It should be noted that, as of 1 January 1988, successful completion of the QL7 Course is a prerequisite for promotion to Master Warrant Officer. The plan is to have two courses of 20 students per year, and this should ensure the system has enough Warrant Officers qualified for promotion.

The objective of the QL7 Course is to provide LEME Warrant Officers with the knowledge and skills required for employment at the rank of MWO and CWO, in the functions of:

a. Platoon 2ICs in units and workshop maintenance platoons,
b. Control Officer in a static workshop or a maintenance company,
c. G4 Maintenance Staff appointments in Brigade and Command Headquarters, and
d. Life Cycle Material Managers.

The course is 35-training-days long and demands a great deal of the students. The result of the course is well trained Warrant Officers who are better able to undertake the demanding duties of a Master Warrant Officer in the LEME Branch.

The Ralph Libbey Award

by Capt G.R.C. Emmerson

In June 1988 the Libbey Trophy was presented for the second time. As trophies go, it is a little unusual. It does not mark the winner of a sporting event or first place finish on a course. Instead, it is presented to an instructor who is deemed to have contributed the most, or performed the best, during his tour at the School. It is to be presented annually and is open to all instructors of any trade.

The choice for the 1988 presentation proved extremely difficult. In fact, the tie could not be broken; so, it was awarded to two members of the staff.

MCpl D.W. Lindbeck, of Artisan Company, is an FCS Tech 432. Although he taught electronics and digital computers very successfully, his real forte was the MILIPAC. MCpl Lindbeck has since been posted to Wainwright, where, presumably, he will get a chance to practice his excellent skills and check up on some of his previous students.

Cpl D.M. Mosher is a Veh Tech 411, whose outstanding contribution to Vehicle Company and the School was in the Electrical Station. After three years in CFSEME, he has been posted to CFE with the 8th Canadian Hussars.

MCpl D.W. Lindbeck and Cpl D.M. Mosher receive the Ralph Libbey Award from the CFB Borden Base Commander, BGen R.S. Dziver.

Commandant CFSEME Visits REME Training Units in UK

by Maj R. Hulmes (REME)

The Commandant of CFSEME, Col J.G.G. Nappert, made a liaison visit in Sep 88 to REME units in UK to discuss EME matters, particularly the training of young technicians and officers.

Units visited were the School of Electronic Engineering (SEE), the REME Officers' School, the REME Training Battalion and Depot which conducts all REME recruit training and career leadership courses, and the REME Training Centre which commands these units in Arborfield, together with the Princess Marina Apprentices College.

The Commandant also visited the School of Electrical and Mechanical Engineering (SEME), REME's first trade training school at Bordon (note the different spelling), where he saw up-to-date training techniques using computer technology, and sophisticated vehicle training aid mock-ups. Among the notable people he met was Maj J. Foster, the LEME Exchange Officer at SEME and opposite number to the British Exchange Officer at CFSEME. Col Nappert also watched the Artificer Selection Board in action, where young NCOs are selected for promotion and training beyond Staff Sergeant (WO). The selection process covers fitness, academic ability, confidence and leadership skills, of which the latter two are well tested over a three-day period.

Bordon Garrison is well known to Canadian Forces as many buildings standing today were built by the Royal Canadian Engineers as a Base Workshop for the Royal Canadian Ordnance Corps, during the Second World War. The cornerstone recognising this, laid by Gen A.G.L. McNaughton GOC in C First Canadian Army, stands today 46 years later and is part of the Welding Training Building. On the subject of history, time was found to visit the REME Museum and view the Allied Forces exhibit with its many Canadian artifacts.

During his UK trip, Col Nappert stayed at West Court, the REME Headquarters mess in Arborfield, purchased by the Crown in 1953, but with a history (and plumbing) dating back to the twelfth century.

The cornerstone laid by General McNaughton at Bordon, Yorkshire, England. One of several buildings Canadians built during World War II.

Major J. Foster, Colonel J.G.G. Nappert, Major M. Syre watching a practical leadership test on the Artificer Selection Board.

Kit Shop Update

By Capt R.P. McNaughton

The Kit Shop has been reducing the amount of stock held, and holding back on the introduction of new items until a final decision is reached regarding the readoption of the 'horse' as our badge. This may affect the availability of high cost and slower moving items during the period of 1 January 1989 until approximately two months after the decision is made As an interim measure, the procurement of some items, such as plaques with the three RCEME/LEME crests, is being pursued. Fast moving items, such as T-shirts and sweatshirts, should be available as normal. If a desired item is no longer held by the main kit shop, it might be available from one of the sub-kit shops at the different units. Contact them and you may be in luck.

One new item, which members have proposed and is slated for acquisition once the badge decision is made, is a LEME windbreaker with an embroidered badge.

The most current price list is that which is dated 1 January 1988.

Sadie

by Capt G.R.C. Emmerson

Sadie was an Italian peasant girl liberated by RCEME technicians during WWII. Without a murmur, she carried a rifle for the rest of the the war, and followed her new comrades-in-arms through Italy and into NWE. Her smile never waivered, and when she stood guard for tireless hours outside the Control Office, it brightened the day of everyone who entered. An enviable war record. However, many of our numbers have never seen Saide, and even fewer know her story. The first part of the problem should be solved now that she stands in the entrance to CFSEME HQ for all to see. Hopefully, a short recap of her pers file and war record will help many understand her a little better.

During the winter of 1943, No 1 Inf Tps Wksps was on the Italian Adriatic coast near Lanciano. One particular villa in the area had been completely reduced to rubble; yet in the middle of it all, and almost totally untouched, was this statue of a peasant girl. She was quite attractive; but standing there amongst the rubble she must have looked even more beautiful to the war-weary and glamour-starved techs of RCEME. She was coerced into returning to the unt lines, where she was soon kitted out with her own helmet, old rifle and bayonet. She became affectionately known as Sadie, and stood guard at the entrance to the Workshop Control Office. Every time the workshop moved, so did Sadie, until at war's end she found herself in Arnhem (having travelled by ship from Italy to the south of France, then by truck through France, Belgium and Holland). After all this, her loyal comrades were not about to desert her, so she was posted to Canada. The details of her immigration formalities are not recorded, which is probably for the better. Nonetheless, she arrived safely and took up residence at the RCEME School in Barriefield. When the School moved to Borden and was amalgamated with other technical branches of the Canadian Forces, Sadie was without a home. She was moved to the Borden Military Museum, where she stood amongst the RCEME memora-belia but separated from the men.

Col (Ret'd) A.L. MacLean pauses during the 1988 LEME Birthday Celebrations to renew a very old and long-standing acquaintanceship with Sadie. She was "brought home" only days before the celebration.

At last, in the summer of 87, Sadie was moved to the new EME School, among the younger generation of her old comrades.

EME Commanders Course

The EME Commanders Course (formally known as the EME Advanced Course), has now been conducted three times in the new format. Once a year (the course is run in the Fall) invitations are sent out to selected officers to join the incremental staff at the School. As the instructor resources within Regt Coy are very tight, and the course runs just once a year, this couse is run under the guidance of the Chief Instructor of the School with two experienced majors (incremental staff) acting as Directing Staff.

The aim of the course is to prepare captains and majors to be workshop commanders. It also prepares them for various other field roles and staff positions at command level.

The course has taken some time to develop, but it is now firmly entrenched. From 1989 on, the LEME Senate will screen all nominees prior to their selection for the course.

With the continuing evolution of workshop procedures, and the introduction of managerial tools such as WNS and the new WA99, the course will be essential to ensuring the effective training and updating of officers associated with workshop management.

Dress Matters

By CWO J.E.Y.R. Roy
LEME Branch CWO

Scarlet Mess Dress

Approval has been obtained to use barathea as the alternate material to doeskin. The wearing of the waistcoat is no longer limited to field and senior officers. It is now mandatory for all male EME officers and CWOs. Cummerbunds will continue to be worn by MWOs and below. The rank badges for non-commissioned officers and Warrant Officers will be the scarlet backed version vice the midnight blue backed version used on the previous mess dress. Sprecifications for the female and male Army mess dress are now completed and can be obtained under NDID D-87-001-356/SF-001 and D-87-001-355/SF-001.

Embroided Shoulder Titles

The EME/GEM embroided shoulder titles were approved in principle by the National Defence Committee for Dress and Ceremony and will be produced shortly.

Metal Shoulder Titles

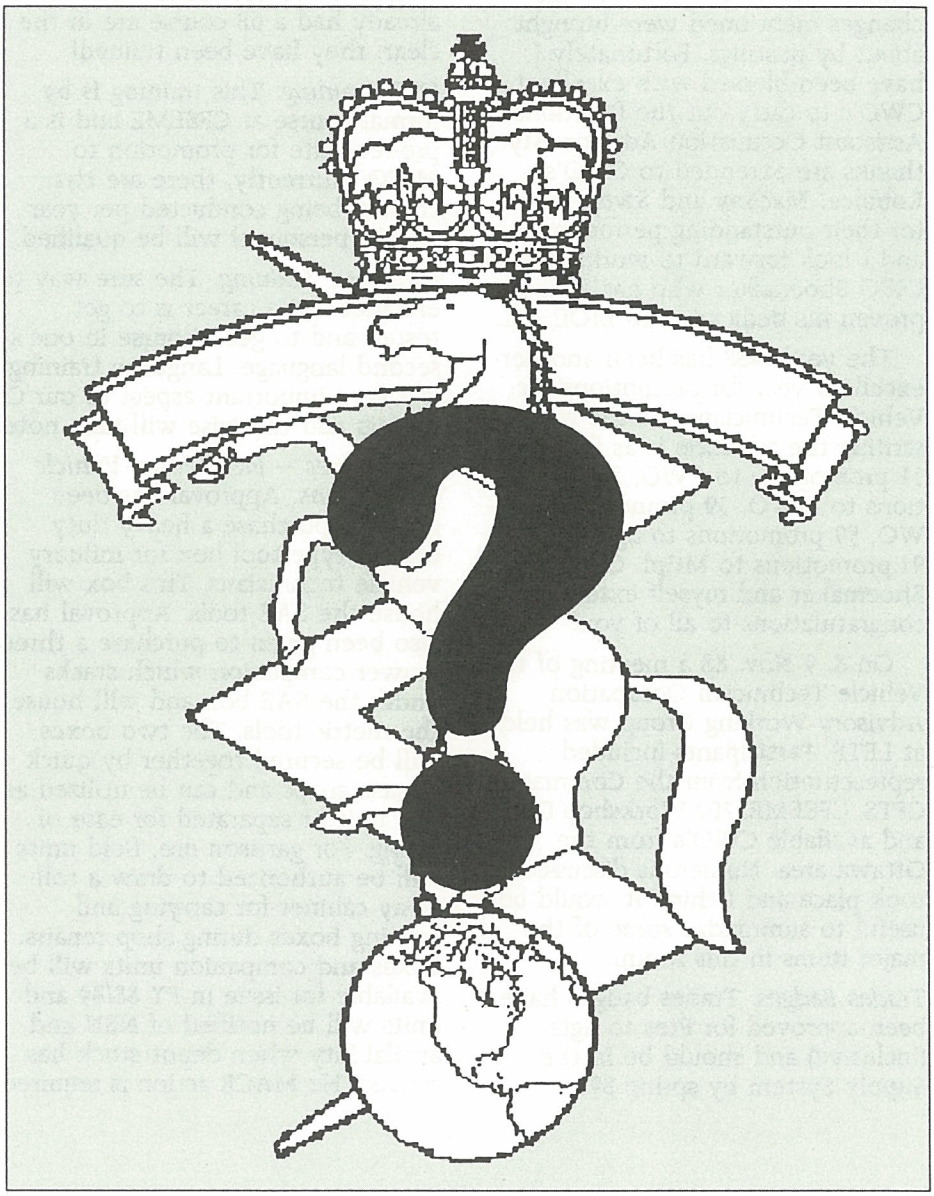
The EME/GEM metal shoulder titles have been prototyped and trialed. They will be available in the kit shop in the near future.

Buttons and Combat Hat Badges

Due to the attempt to obtain a new hat badge these items have been put on hold until further notice.

Trades Badges

These badges are in production and should be available in June 1989.



TRADES UPDATE

Vehicle Technician
Occupation Advisor Update

By Lcol R.P. Britt

Since assuming the duties of Vehicle Technician Occupation Advisor in Sep 85, it seems that I have had to continually appoint new assistants. I started off with CWO Phil Robblee in 1985 who was replaced by CWO Jim MacKay in 1986, followed by CWO Mike Swerdferger in 1987 and finally by CWO Wayne Shoemaker, the current assistant, appointed in APS 88. For those of you who thought that you cannot post a "Chief" all of the changes mentioned were brought about by postings. Fortunately I have been blessed with excellent CWO's to carry out the functions of Assistant Occupation Advisor. My thanks are extended to CWO's Robblee, MacKay and Swerdferger for their outstanding performance and I look forward to working with CWO Shoemaker who has already proven his dedication to MOC 411.

The year 1988 has been another excellent year for promotions for Vehicle Technicians. At the time of writing the situation is as follows: 11 promotions to CWO, 26 promotions to MWO, 39 promotions to WO, 59 promotions to Sgt, and 91 promotions to MCpl. CWO Shoemaker and myself extend our congratulations to all of you.

On 8, 9 Nov. 88 a meeting of the Vehicle Technician Occupation Advisory Working Group was held at LETE. Participants included representation from the Commands, CFTS, CFSEME, 202 Workshop Depot and available CWO's from the Ottawa area. Numerous discussions took place and I think it would be useful to summarize some of the major items in this forum.

Trades Badges. Trades badges have been approved for Ptes to Sgts (inclusive) and should be in the Supply System by spring 89.

QL 6A Training. Whereas the 6A qualification was by OJT and the 6B qualification was by formal course, the situation has now been reversed to provide the necessary technical training earlier in one's career. To ensure that no one misses the formal training at either the 6A or 6B levels, those qualified 6A by OJT will have to take an adjustment course while those not yet qualified to 6A level will have to take a formal 6A course. Those who have already had a 6B course are in the clear; they have been trained!

QL7 Training. This training is by formal course at CFSEME and is a pre-requisite for promotion to MWO. Currently, there are two courses being conducted per year and 24 personnel will be qualified.

Language Training. The sure way to enhance one's career is to get tested and to get a course in one's second language. Language training is a very important aspect of our CF careers and the wise will take note.

Tool Boxes – Field Force Vehicle Technicians. Approval has been given to purchase a heavy duty drawer type tool box for military vehicle technicians. This box will house the SAE tools. Approval has also been given to purchase a three drawer companion which stacks under the SAE box and will house the metric tools. The two boxes will be secured together by quick release snaps and can be utilized as one unit or separated for ease of lifting. For garrison use, field units will be authorized to draw a roll-away cabinet for carrying and moving boxes during shop repairs. Boxes and companion units will be available for issue in FY 88/89 and units will be notified of NSN and availability when depot stock has arrived. No MACR action is required.

Metric Tools. A major purchase of metric tools is presently being made. Eventually, all technicians will have a complete set of metric tools. Again no MACR action is required.

Automotive Test Equipment. Auto-Sense is pretty well gone from the CF. Plans have been made to purchase three different sets of test equipment under the "Buy and Try" program in FY 89/90. These units will undergo trials in 2 Svc Bn, Petawawa and in CFB Ottawa. Based on these trials a specification will be written and this will be used as the basis for procurement of suitable (and modern) automotive test equipment.

Performance Oriented Electronics Training (POET). This will likely be introduced in 1989 as part of a vehicle technician's training. With all the electronics in modern vehicles the LEME Branch is doing its best to keep up with technology and POET is a move in the right direction.

In this short article, I have tried to bring you up to date on some of the happenings in the Vehicle Technician Occupation. I am always interested in feedback and so is the EME Journal. Let us hear from you!

FROM DGLEM

DLES Update

Ongoing Developments in Policy and Doctrine

by DLES 2

General. The mandate of DLES 2 is to develop and outline policy and doctrine on behalf of DGLEM. In this initial article for the "new" format of the EME Journal we in DLES 2 wish to discuss four areas that we have been working on:

a. Manual Maintenance Management System (MMMS);
b. Land Maintenance (LM) vs EME System;
c. DCER/DLES Scales; and
d. Doctrine.

MMMS. In order to standardize procedures employed in maintenance management, MMMS was introduced to static workshops two years ago. Over the past year, as DLES 2 staff has toured various etablishments, it has become apparent that we have not yet achieved this standardization. In order to speed up the standardization process DLES 2 will be conducting MMMS seminars for all workshop management personnel.

Since the introduction of MMMS it has also become apparent that the fundamentals of maintenance management are the same for field units as for static ones. The decision has therefore been made by DLES in conjunction with the FMC and CFE maintenance staffs to place all field units on MMMS by July 89, and it is intended to conduct MMMS seminars for all field units as well.

In an attempt to ease the clerical burden for the control office staff of the maintenance organizations, IBM compatible computers and printers are being provided to all Base Maintenance and Field Maintenance Organizations as well as various software packages designed to perform the Time Accounting calculations called up in MMMS. One of two types of computer will be provided:

a. Static Wksps – IBM Compatible Desk Top with 5-¼" Floppy Drive and 30Mb HD Drive; EPSON 80 column printer; and
b. Field Units – Zenith Lap Top with 3-½" Floppy Drive and 20Mb HD Drive; EPSON 80 column printer.

The above mentioned Computers should be in the workshop by the time of this Bulletin. The MMMS software will be given out at the MMMS seminars as a graduation present to the control office personnel taking the seminar.

LM vs EME. At the last Branch Senate meeting it was decided to refer to the maintenance system as the Land Maintenance (LM) System vice the EME System. The main purpose of this change was to recognized the fact that although DGLEM is the OPI and manages the maintenance system for Land technical equipment of the CF, EME personnel only represent a portion of the personnel involved in the maintenance system. While we are the largest technical group (but not the only one) involved the equipment operators are the largest group in the Maintenance System. By going to a "generic" description we avoid the impression that only EME personnel are responsible for or involved in the maintenance business.

DCER/DLES Scales. Over the past several years DLES in concert with DCER have been developing joint workshop construction scales based on numbers of personnel involved and equipments to be supported. At long last these efforts have begun to reach completion. The scales for vehicle maintenance have been accepted by DCER and the other aspects such as the other trades and control office requirements are nearing approval. The point to be made is that if you are developing a requirement for working space contact DLES 2-4. We might save you some work and provide data to validate your requirement.

Doctrine. Doctrine is the way we do business. Much effort has gone into research and staffing our concepts to all interested parties before doctrine is published. Do not violate doctrine lightly. If you deviate from doctrine and you fail, you should be punished. If you deviate from doctrine and you are successful, advise DLES 2 through your chain of command. We might give you an "Attaboy" and change the doctrine.

DLES 4 Organization

DLES 4 as currently organized, has two sub sections with responsibility broadly as follows:

a. **DLES 4-2**
   (1) Functional tasking of 202 Wksp Depot and LETE; and
   (2) Management of Contract Support funding and Repair and Overhaul funding allocated by Director Procurement and Supply Land (DPSL).
b. **DLES 4-4**
   (1) Land Maintenance System Workshop tools and equipment, and machine tool entitlements; and
   (2) OPI for the DGLEM sponsored Miscellaneous Requirements (Minor Projects) submissions.

Tool Kits

Over the past 3 years action has been taken to review the FCS, Wpns and Mat Tech tool kits. The current situation is as follows:

a. FCS Tech (Military and Civilian) The Optical and Electronic Tool Kits are now being prepared for distribution to all bases by 1 and 25 CFSD.
b. Wpns Tech (Military and Civilian) An approval by the

trade to proceed with amendments was received in 1988; funding to update the existing Tool Kit will be made available FY 89/90, EDC Jan/Feb 1990.

c. Mat Tech (Military) Proposal approved by ADM(Mat) Dec 88. Currently being staffed for issue of tool kits in 1990.

Future Projects

a. The Radar and Radio Tech Kit will be reviewed in conjunction with DGCEEM.

b. Civilian Tradesmen tool kits are in course of review.

Maintenance of Land Equipment by Contract

This is covered in detail by CFTO C-04-005-035/AM-000; a revised version of which is now being reviewed by Commands. Part 5 of this CFTO deals with the Master Repair Agreements (MRA) for vehicles. The funding of these agreements is controlled by DLES 4.

Presently four MRAs are in effect with the following manufacturers:

a. Chrysler Canada Ltd. (Chrysler);

b. Ford Motor Company of Canada Ltd. (Ford);

c. General Motors of Canada Ltd. (GM); and

d. Navistar International Corporation Canada (Navistar).

MRAs have the following advantages:

a. The dealers are normally well equipped and staffed to carry out quality work;

b. the pricing basis has been agreed with the manufacturer. Therefore:

(1) Normally only one dealer is required to provide an estimate; and

(2) If dealer estimate appears unreasonably high, another dealer may be asked to estimate on a separate DND 602, paying if necessary for the estimate(s) on which repair was not authorized.

MRA Funding

a. Annual allocation of funds are made by NDHQ/DLES 4 to commands, who then allocate funds to their Land Maintenance Units. These allocations are usually based upon annual expenditure estimates, which are made to NDHQ in January each year.

b. All invoices ultimately end up in DLES 4 for consolidation and auditing prior to submission to DPSF for payment. To make the system work efficiently please note:

(1) For any work estimated to cost in excess of $5,000, NDHQ/DLES authority to proceed is required PRIOR to work commencing; and

(2) Invoices and supporting data must be forwarded to DLES 4-2 as quickly as possible.

c. For ease of reference the personalities in DLES 4 involved with MRA funding are:

(1) Mr H.C. Pettigrew (819) 997-9530 (DLES 4-2)

(2) Mr M. Nathoo (819) 997-9546 (DLES 4-2-4) who will assist with any questions of policy or matters of detail.

d. Maintenance units are reminded that they must inform their commands on all correspondence with NDHQ.

Miscellaneous Requirements (Minor capital projects) Management

Miscellaneous Requirements (including Materials Authorization Change Requests (MACRs) for items costing less the $1M in the categories such as Machine Tools, General Purpose Test Equipment (GPTE), and Workshop Tools and Equipment for Land Maintenance Units, are staffed within NDHQ by DLES 4. However, it should be noted that DGLEM is only responsible for the sponsorship of Workshop Tools and Equipment (e.g. vehicle hoists, hand tools, small machine tools, etc.). DCETS is responsible for sponsoring GPTE (Stock Class 6625) and DPSupM responsible for sponsoring Machine Tools (e.g. lathes, milling machines, etc. of NATO Stock Groups 32 & 34).

DGLEM was allocated $2.5M in FY 88/89 for sponsored Workshop Tools and Equipment which enabled much of the backlog of submissions to be cleared. The allocation of FY 89/90 funds is expected shortly and it is anticipated that this will meet our immediate needs.

Approximately 60% of all MACRs (CF 408) raised by CF during the year are approved at Base or Command levels. The remainder, some 3,600, are forwarded through the parent command to NDHQ for processing and approval consideration, and if approved, a letter of approval will be issued by the Director Material Authorization (D Mat A). These NDHQ approved MACRs are satisfied in turn in one of three ways:

a. from national assets;

b. from DG Proc S funds if the requirement can be satisfied *by a catalogued item* subject to national procurement (i.e. no current depot stocks of the item) and where *the total MACR value does not exceed 20 thousand dollars*; or

c. from sponsored funds (e.g. DGLEM, DPSupM, DCETS, etc) if the need is for non catalogued items, or *for catalogued items* whose *total value exceeds 20 thousand dollars.*

It takes a considerable amount of time to fully staff, fund and subsequently procure your needs. This process could be expedited some what if the need is fully and comprehensively substantiated in Block 5 of the MACR.

Workshop Management System (WMS) Update

by Capt D.T. MacLean

A THING CALLED WMS

What is this thing called WMS? It is the acronym for the new, improved Base Static Automated Maintenance Management System (BSAMMS). BSAMMS was designed for static maintenance units only, whereas WMS encompasses both field and static maintenance units.

PROJECT UPDATE

WMS is part of the Base Automated Data Processing (BADP)

project which encompasses five other systems:

a base transportation system (BATOPS);
a base military personnel system (BLIPPS-M);
a base civilian personnel system (BLIPPS-C);
a base construction engineering system (BCEMS); and
a base pharmaceutical system (BPHARMS).

All systems will be programmed in the same language, have similar hardware, and be able to exchange information as required. For example, when a vehicle requires servicing, WMS will relay that information to the transportation section via BATOPS. When a person is posted into a workshop, the BLIPPS-M system, located in the Base Orderly Room, will forward all required details to the maintenance organization via WMS.

The BADP system is a large, complex and state-of-the-art system with a cost in excess of fifty million dollars. As with any project this size there are a number of developmental stages that must be completed in sequence. Some of these stages have resulted in lengthy delays; ie: the analysis and design required prior to purchasing computers and a computer language. Further delays have been caused by the new DND security policy and the bilingual technical documentation requirement. Since WMS is only one component of the BADP system, it is necessarily tied to the overall procurement timetable for the system, with all six BADP sub-systems being slated for implementation during the same time frame. The bottom line is that the earliest delivery date is late summer of 1990.

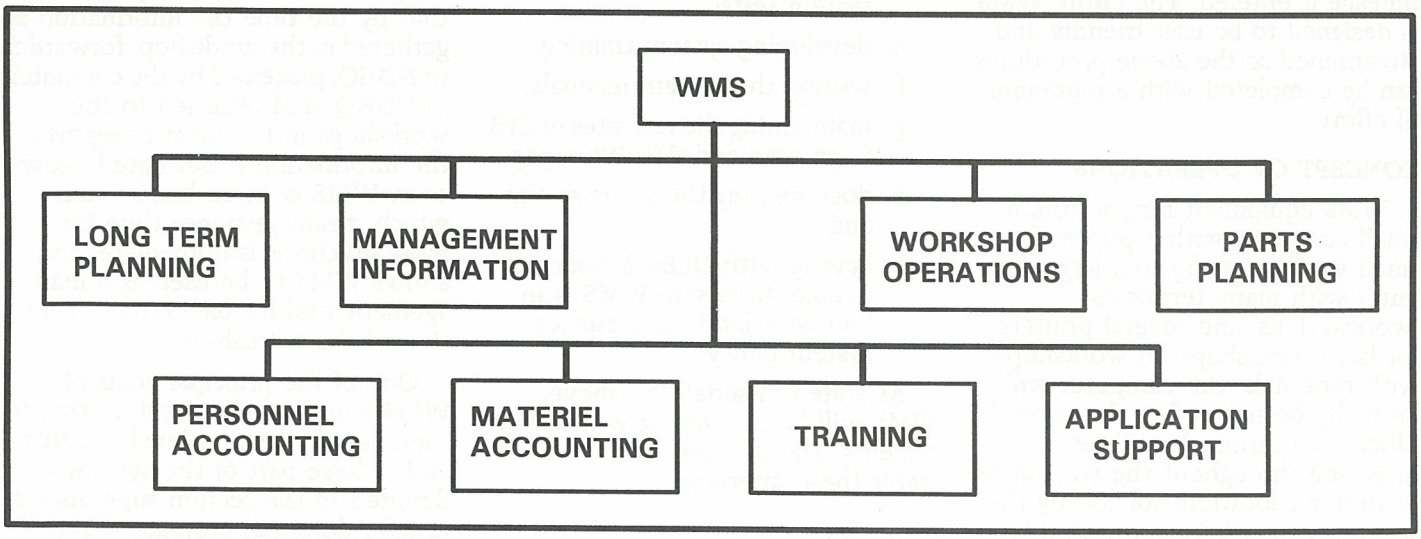
WMS OVERVIEW

As the diagram below illustrates, WMS is divided into eight sub-systems. Each of these sub-systems is further divided into functional modules. Since a complete sub-system is too large to describe in this article, I will describe a portion of one of the more important sub-systems dealing with workshop operations. The workshop operations sub-system is used to control and document the flow of work through the workshop, and is divided into first and second line functions. A trial second line system has been in operation at CFB Winnipeg and CFB Gagetown for almost two years and is now familiar to many people. However, the first line workshop operations package has not been seen by anyone other than DLES personnel, therefore I will describe some features of this sub-system.

The best way to illustrate the first line package is to describe what will happen when an equipment breaks down and repairs are requested. For example, when a base transport vehicle requires repair, the driver will normally contact the transportation section. If BATOPS is installed, the maintenance coordinator for BATOPS will enter the repair request in the system, and then transmit the request electronically to WMS. This request will sit in an electronic in-basket of the WMS until the EME section supervisor accepts the request. In field units, since BATOPS will not be available, the work requests will be delivered as per the existing system, and the maintenance section will enter the request in WMS. WMS will then automatically provide the supervisor with the following equipment details:

a. overdue servicing/inspections;
b. outstanding modifications;
c. warranty information (partial warranty, ie: exhaust system warranty, and/or full warranty);
d. outstanding work required on the equipment;
e. backordered parts received for this equipment; and
f. maintenance messages (for example: "Use only ACME brake fluid in this equipment's brake system").

One of the big advantages of a computerized system for first line work is that the computer never forgets details regarding an equipment. I recall how difficult it was as a sergeant in charge of a busy servicing section to keep track of the above information. The walls of the typical first line section supervisor's office are covered with charts of CFR numbers to indicate when equipment is due for maintenance, while other sections employ card systems or a combination of cards and charts. These manual card and/or chart systems may work for many sections, but they are difficult



to maintain, normally do not hold all of the required information, are error prone, and require a great deal of time and effort in order to be effective.

Let's get back to the repair request. The section supervisor now has a request for a repair, plus all the above equipment details. To assist the supervisor in scheduling the work request, the WMS system will inform the section supervisor about all other outstanding work in the workshop, as well as any upcoming work. Also, automatically available is information about section personnel, including who is available for work, what jobs are assigned and to whom, and other valuable information. In our example, after a technician looks at the vehicle and determines what repairs are required, the section supervisor can proceed with booking the job into the shop. Additionally, the WMS provides a complete parts ordering package, plus it handles all of the LOMMIS reporting requirements such as detailed reporting, supplementary data reporting, modification reporting, etc. The section supervisor can assign the visit to a person or a team, and WMS provides a hard copy work order automatically for the technician's use. All of the above procedures require very little typing, since most of the equipment information remains permanently in the computer. For example, when an inspection is completed, the machine is programmed to automatically calculate exactly when the next inspection is due, and continuously updates this information automatically as mileage is entered. The entire WMS is designed to be user friendly and streamlined so the above procedures can be completed with a minimum of effort.

CONCEPT OF OPERATIONS

WMS equipment ranges from a small computer with a printer for small workshops, up to a large computer with many terminals (workstations) and several printers for large workshops. In workshops with terminals, the computer will normally be situated in the control office. The terminals will be dispersed throughout the workshop in strategic locations for use by the sections and will be connected to the computer by cable or by modems. The printers will be available as required for reports, or to print copies of work orders, etc. When a field unit deploys, the main computer will normally go to the field with the unit, while additional computing resources will remain in garrison for rear parties. Units operating in a decentralized maintenance mode, such as armour or artillery maintenance organizations, will have computing resources available for the detached elements. MRTs doing "in situ" work in the field will use the Manual Maintenance Management System (MMMS), and WMS will be updated after endex or when time becomes available.

LOMMIS will be updated electronically, with no requirement to send paper forms for work or time accounting once WMS is installed and operational. All time summaries required by MMMS will be calculated automatically and included in the LOMMIS updates. These updates will occur more frequently than at present so LOMMIS reports will be more current.

CURRENT WMS ACTIVITIES

Presently, the WMS team is busily employed at the following tasks:

a. developing a field/garrison interface for WMS;

b. firming up interfaces with LOMMIS, BATOPS, BLIPPS, the Financial Information System (FIS) and the Canadian Forces Supply System (CFSS) upgrade;

c. finishing system specifications;

d. developing and documenting system tests;

e. developing system training;

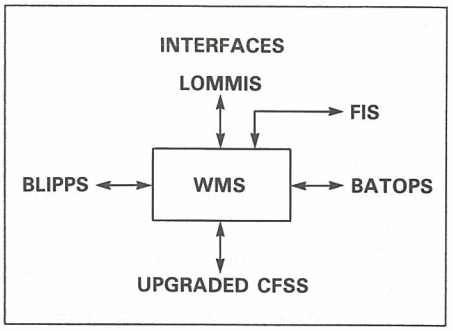
f. writing the system manuals;

g. maintaining the test sites in CFB Gagetown and CFB Winnipeg;

h. documenting the entire system; and

i. liaising with DLES 2 (policy people) to ensure WMS is in line with land maintenance system policy.

As stated in serial "b" above, WMS will be interfacing with other systems. The diagram below illustrates these interfaces.



We anticipate having programmers available to begin work on the final version of the system by January 1989, and once programming starts, the team will be busy with the programmers making sure the system is programmed the way it was designed.

WMS — MMMS INTERFACE

It is common knowledge that computers can and do fail, therefore we anticipate that the WMS computer system will fail occasionally. When this happens, the fall-back position is the Manual Maintenance Management System (MMMS). WMS is based on MMMS, therefore, it is essential that MMMS policy be rigidly adhered to. It cannot be overemphasized that MMMS and WMS are companion systems, and people involved with land equipment maintenance must follow MMMS procedures, since these procedures compliment WMS.

WMS BENEFITS

LOMMIS gathers maintenance information which is extremely valuable to NDHQ and Commands, however, this information has limited value within the workshops. One of the main problems is that by the time the information is gathered in the workshop, forwarded to NDHQ, processed by the computers in NDHQ, and returned to the workshops in the form of reports, the information is out dated. However, WMS is an on-line system which means response time for most functions is immediate, and allows WMS to be used as a management tool for day-to-day operation of the workshop.

One of the principal goals of WMS is to provide a system that is useful at the section level. To this end, a large part of the system is devoted to the section supervisor's tasks. Additional programs have

been designed for workshop commanders, platoon commanders, technicians, parts co-ordinators, contracts co-ordinators, control officers and production officers, planners, control office clerks, orderly room staff, scaling NCMs, training staff and other personnel in a workshop. WMS is designed for use by large workshops or small detachments and everything in between, as well as for field employment. WMS will also have word processing capabilities, graphics capabilities, and some office automation tools. Two other benefactors of WMS will be NDHQ and Command HQs, since information passed to NDHQ and the Commands via WMS will be much more timely and accurate. Many of the reporting errors that must be re-input in the LOMMIS system will be identified and corrected immediately in WMS. For example, the very familiar usage error that causes so much heartburn in LOMMIS will be detected on input in WMS, allowing the system user to immediately make necessary corrections before sending the information to NDHQ.

WMS is designed as a land maintenance management tool by EME personnel to meet the requirement for greater maintenance and repair management of today's and tomorrow's complex equipment. WMS has been slow in coming and will probably not be perfect in it's initial form, but WMS will be instrumental in providing better service to all EME customers. Land equipment maintenance is a big and expensive operation, and we must computerize this undertaking both for today and for the future, and WMS does exactly that.

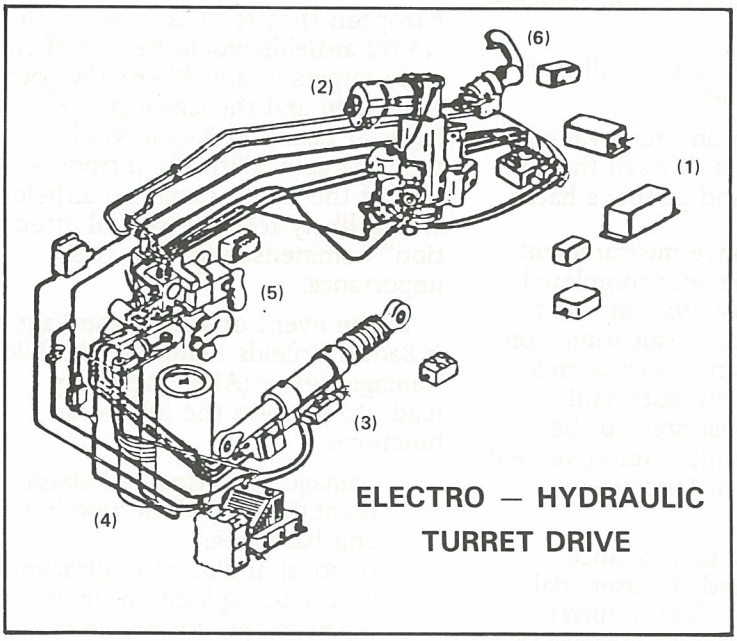
DCMEM Update

Electric Turret Drive for the Leopard C1

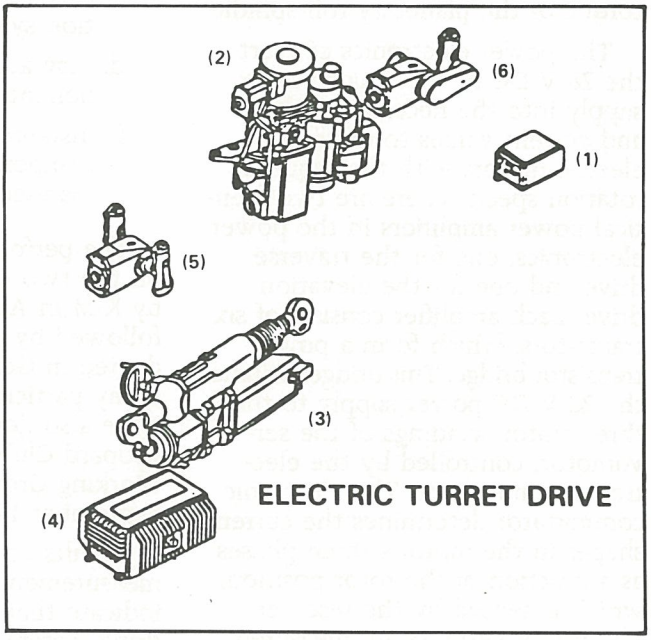
by LCol J.V. Glaus

The design of the Leopard C1 MBT gun laying and stabilization system was based on electro-hydraulic technology developed for the M48 MBT. As a consequence, this system has several performance deficiencies related to age, design, safety and operational effectiveness. In view of these shortcomings and the reported advantages in electric drive systems, DCMEM proceeded to evaluate an AEG electric drive system, which is representative of the current state of this technology, for use in the Leopard C1.

The tank manufacturer, Krauss-Maffei (K-M) was contracted to install the AEG electric drive system into a Leopard C1 and to measure and evaluate its performance. K-M were also contracted to measure and evaluate the performance of a turret modified with an improved hydraulics package, frequently referred to as the SRK. An SRK kit was installed in a Canadian tank by German Army Maintenance Plant 850 during R&O of the tank. Approximately 2.8 tonnes of additional weight was added to the turrets to assess growth potential of the two



ELECTRO – HYDRAULIC TURRET DRIVE



ELECTRIC TURRET DRIVE

MAJOR COMPONENTS OF TURRET DRIVE SYSTEMS

(1)	Stabilization Electronics	(4)	Power Supply
(2)	Traverse Drive	(5)	Gunner's Control Handle
(3)	Elevation Drive	(6)	Commander's Control Handle

systems. K-M were also tasked to provide a cost comparison of the two drive systems.

The major components of the electric drive system are: traverse and elevation electric motors and gearing, the Anti-Backlash-System, the slip clutch including the No-Back-System (brake) and manual drive gear, the manual drive, and the traverse indicator. The traverse drive is installed at the right-hand side of the turret at the same place as the current hydraulic drive, and the elevation drive is installed between turret and weapon, almost identical to the current cylinder.

Both the traverse drive and elevation drive motors are 28 V DC three phase brushless servomotors with permanent magnet excitation. The commutation is achieved electronically by means of a brushless rotor position transducer and electronic network in the power electronics. For the elevation drive a planetary roll spindle is used to convert the rotary motion of the motor into linear movement. The anchor points at the turret and weapon are the same as those for the hydraulic drive. Two additional supports were installed to prevent backlash produced by the friction torque of the planetary roll spindle.

The power electronics convert the 28 V DC of the tank's power supply into the necessary voltage and current values to drive the electric motors with the required rotation speed. There are two identical power amplifiers in the power electronics, one for the traverse drive and one for the elevation drive. Each amplifier consists of six transistors, which form a power transistor bridge. This bridge switches the 28 V DC power supply to the three stator windings of the servomotor, controlled by the electronic commutator. The electronic commutator determines the current shapes in the motor's three phases as a function of the rotor position, which is sensed by the resolver. The motor currents are measured by shunt resistors (current sensors) and fed back as actual current values to the respective current controller, where they are compared with the nominal values of the velocity controller.

The stabilization Electronics contains all electrical and electronic components for:

a. generating and distributing the voltage for the One-Axis-Gyro, the Two-Axes-Gyro and all control networks in the Stabilization Electronics;

b. processing of logic input signals coming from the turret electric system;

c. activating and controlling the drive systems by logic signals;

d. processing of the input signals coming from the Gunner's and Commander's Handles, from the fire control system (Super Elevation and Lead Angle-signals) and from the drift adjust potentiometers and the gyros; and

e. activating the current controller in STAB ON mode.

Major design features of the AEG electric turret drive system are:

a. easy to retrofit without machining and welding operations on the turret;

b. minimum modification of the interface components;

c. operation identical with the conventional weapon stabilization system;

d. easy accessibility to all components; and

f. installation and removal of components through the commander's and gunner's hatch.

The performance measurement on the two tanks was completed by K-M in August 1988 and was followed by a user evaluation, conducted in Germany, with German Army participation. Both tanks were also demonstrated to the Leopard Club Combat Improvement Working Group in Munster in September 1988.

Results of the performance measurements and the user trial indicate that the electric turret drive system is clearly superior to both the in-service system and the SRK system. The cost comparison study indicates that conversion to electric drive would pay for itself well before the planned replacement date of the Leopard C1 due to the systems much lower maintenance cost.

PM Tank also participated in this evaluation to determine if an electric drive should be an essential requirement for the new tank.

Development of the DAREOD Vehicle for Airfield Damage Repair

LCoL M.E.J. Whitty
Maj J.G.C.G. Fraser
Capt M.J. Hauschild

LCol Whitty is a Military Engineer working as Project Manager for the Airfield Damage Repair Project. Maj. Fraser, an EME officer, is the OPI for the DAREOD vehicle and Capt. Hauschild, a Military Engineer, is OPI for the DAREOD Clearing Blade.

Prior to the Viet Nam war, airfields were generally regarded as safe heavens, locations where flying operations could be conducted without enemy interference. Experience in that conflict changed that perception and showed that airfields were in fact, vulnerable. In the European theatre, it is believed that NATO airfields would be one of the early targets of any WARSAW pact aggression and the Canadian airfields at Lahr and Baden would be prime targets. With the introduction of the CF-18, Canadian airfields would likely receive "special attention" commensurate with their importance.

In the event of attack, the Lahr & Baden airfields require an Airfield Damage Repair (ADR) capability ready to perform the following functions:

a. damage definition and assessment (RECCE) of the aerodrome and base area;
b. removal and/or neutralization of any unexploded ordnance;
c. repair of the runway and other aircraft operating surfaces; and
d. restoration of all essential services, including power, water, and A/C arresting systems.

PROJECT A-1265 — AIRFIELD DAMAGE REPAIR

To respond to this challenge, the CF is implementing a $60 million project, named Airfield Damage Repair (A-1265). It will provide the vehicles, equipment, infrastructure, and personnel to accomplish the above tasks in wartime.

One hundred and six prime movers are included as part of the project. These vehicles have been divided into a number of commercial truck fleets, (2 tonne-light, 7 tonne medium, and 32 tonne dump trucks-heavy) and procurement is proceeding rapidly, with delivery commencing in FY 88/89. The most interesting aspect of the project from an EME perspective, is the development of the Damaged Airfield Reconnaissance Explosive Ordnance Disposal or DAREOD vehicle.

ROLE OF THE DAREOD VEHICLE

The DAREOD is designed to carry out the first two recovery functions: Reconnaissance (RECCE) and Explosive Ordnance Disposal (EOD).

The requirements of these two distinct tasks were integrated into one vehicle. There will be eight vehicles designed and produced with four being deployed to each CFE airfield.

DESCRIPTION OF THE VEHICLE

The DAREOD is essentially a modified version of the now "old" M113 Dozer. The main chassis modifications are as follows:

a. *Turret.* One turret with a .50 cal HMG capable of single automatic fire. The secondary armament will be a coaxial 7.62 mm MG also capable of single and automatic fire.

b. *Optics.* In order to perform both Reconnaissance and EOD tasks, the optic requirements far exceed those of M113 Dozer or Pers Carrier. New features were added to supplement the driver and crew commander's normal field of view. This includes a periscope on the right rear of the APC, a second at the front left for the driver to provide vision along the tracks and a vision block on the rear ramp;

c. *Hatch.* To provide the EOD operator with vision as well as protection, a hatch similar to the commander's cupola (but fixed), was added. This eliminated the requirement for a cargo hatch;

d. *Lights.* Floodlights were mounted on the vehicle and a powerful spotlight was placed on the turret.

e. *Storage configuration.* As the DAREOD is a new concept in the CF, considerable effort has been put into the rationalization of a storage plan. A decision was taken to provide the user units with the PIONEER SECTION VEHICLE's (PSV) storage configuration and the EOD operator work station. The user will then "finalize" the design to suit the need. This decision was made to prepare for the ongoing changes in the concepts and equipment to be provided to the user between design and final delivery.

CLEARING BLADE

The ADR Reconnaissance vehicle (DAREOD) is made unique in NATO, by its clearing blade.

The DAREOD Clearing Blade MK2, a uniquely Canadian concept, is a "vee" blade constructed of mild steel with a hardened steel face. It is hinged at the centre and is equipped with caster wheels which are designed to be used for non-tactical moves. Unlike standard push blades, this clearing blade has a space between the front and rear of the blade of 13 cm. Within this space and between the strengthening ribs of the blade, will be fitted an insert which is comprised of three layers of ceramic. The ceramic layers are separated by 20 gauge steel and are applied to the steel with a 1/8" layer of silicon. The tiles are protected from shock by the silicon on the front, rear and between the tiles, and by a foam layer between the inserts and the blade.

Testing of the blade is being conducted in two phases. The Phase 1 trials, completed in Oct 88, were conducted by LETE in Ottawa in order to evaluate the blade construction and the impact of the blade system on the vehicle. A crew from the EOD Troop in Lahr then assessed the effectiveness of the blade in a trial conducted on the Silver Dart Airfield at CFB Petawawa. This trial demonstrated that the clearing blade was very effective in clearing bombs and debris from an airfield surface. The only major difficulty with the MK 2 Blade is its 2280 kg weight, which imposes an excessive load onto the front two road wheel stations of the APC.

The second testing phase, to be conducted in Spring '89, is a blast trial of the blade and ceramic inserts and an assessment of the operational effectiveness of the blade following explosive damage.

As a result of these trials it was concluded that the blade concept would be retained but that some design changes would be made. In order to correct the serious overloading of the front two road wheel stations, the caster wheels will be converted to a hydraulic system so that they will be in full time use for all operations. This will allow for a much more even load distribution since almost all of the weight of the blade will be on the caster wheels. Some of the other relatively minor changes include: modifying the blade retaining system, ergonomically improving the operator controls; and raising any hydraulic components now too close to the ground.

During 1989 further work will be done on the Clearing Blade MK2. Improvements will be made to the MK2 design and testing will be undertaken on various ceramic inserts. It is expected that by 1990 a fully operational Clearing Blade system will be available for installation on the DAREOD vehicle.

SYSTEM INTEGRATION

The ultimate responsibility for integrating all the components lies with DCMEM 2-2, the LCMM for the M113. This coordinated effort involves many attached NDHQ directorates, user units, and of course a large spectrum of civilian firms.

CONCLUSION

The ability to respond to an enemy airfield attack begins with the capability to RECCE the attached area, determine what has to be done and to associated priorities with those tasks. Removal of the unexploded ordnance allows work to commence. The DAREOD vehicle will ensure these first steps in ADR can be accomplished. The EME Branch has contributed significantly to this "small project", a project which contains all the elements and challenges of a Major Capital Project (MCP).

The Importance of Desiccation and Pressurization of Optical Instruments

By CWO Derk Duermeyer MMM, CD
LCMM Leopard MBT Optics
DCMEM 3-4-4, NDHQ Ottawa

GENERAL

The Canadian Forces have in use numerous optical measuring, sighting and observing instruments. These optical instruments are expected to encounter various environmental extremes. When an optical instrument is subjected to rapid changes in temperature, relative humidity and/or air pressure, it is likely that internal fogging of the optics will occur, rendering the instrument temporarily useless and which may perhaps lead to permanent damage if this fogging should remain unchecked by the maintainers. Fogging occurs when the air within the optical instrument contains moisture that is precipitated due to the environmental changes.

Should this fogging occur during the use of a sighting instrument, the overall effectiveness of the weapon system would be drastically reduced and the user/operating team would be exposed to unnecessary vulnerability during peacetime operations or in the event of war, when engaging the enemy.

HOW TO PREVENT FOGGING, OXIDATION AND FUNGUS GROWTH WITHIN AN OPTICAL SYSTEM

Let us explore the manner in which we can prevent fogging, oxidation and fungus growth within an optical observing, sighting or camera system.

First: It should be noted that all material from which optical instruments are made are to some extent porous, with the result that "breathing" occurs during environmental changes. This breathing effect prompts the ingress of outside moisture into the optical instrument cavity. This moisture will form a film on the optics and their mounting cells which promotes the growth of bacteria and fungus, which in turn deteriorates the quality of the optical components within the instrument.

Second: The problem of fogging and bacterial growth is virtually eliminated by filling and pressurizing the completely sealed and internally clean instrument with a gas which has a low moisture content, or by dehydration of the air within the optical cavity. Remember, when there is no oxygen or humidity, bacteria cannot grow and oxidation cannot take place. Pressurizing the optical cavity ensures that whatever minute leaks might occur will result in a dry gas flowing to the outside, as opposed to moist air flowing to within the instrument cavity. The condition of the dry gas or air within an optical cavity can easily be monitored by installing silica gel cartridges within the sight.

Since the silica gel packages are usually installed and mounted in a cell which has an inspection window the condition of the silica gel and thus the moisture content within the instrument can be readily observed by the user and/or technician. If the silica gel colour has turned to pink or white then it is time to desiccate the instrument and install a reactivated package. The reactivated silica gel package should be purple to blue in colour. The reactivating of most silica gel packages can be done in a small baking oven until the colour is again purple to blue in colour. It is a total waste if these silica gel packages are disposed of in the garbage. Silica gel packages can be reactivated to its original state by heating the silica gel crystals to 150 degrees Celcius over a 5 hour period. One important item must be noted by Users and Technicians alike; the sole purpose of a desiccating cartridge is moisture indication, not desiccation.

Third: Items which will contribute to the promotion of fungus growth and which the technicians tend to forget during maintenance and repair of an optical instrument in the workshop are:

a. The cleanliness of the technician's hands and hair.

b. The cleanliness of the technician's boots and clothing.

c. the permitting of personnel smoking in the work area; (this deposits a film on the optical components which will

consequently decrease light transmission through the complete optical system).

Most technicians are completely ignorant to the great detrimental effect smoking has on the effectiveness of optical components within an optical observing, sighting or LASER system.

d. The cleanliness of the work area, which is directly affected by the:

(1) temperature, humidity and the amount of ions present in the work area;

(2) air cleanliness and filtering system;

(3) number of personnel in the work area; and

(4) good housekeeping.

e. The cleanliness of the grease, oil, sealing and cleaning material used to perform the maintenance required.

f. The cleanliness of the parts used.

g. The method by which the optical components are cleaned.

Fourth: There are numerous other factors which may be included in the above list, these could either be positive or negative in nature. But since we utilize human resources to achieve or arrive at a quality end product we cannot neglect the following human aspects from our list:

a. Does he/she have a sense of belonging?

b. Does he/she have a professional attitude toward his/her job; or does he/she have a "that's good enough" attitude?

c. Does he/she have a supervisor who knows his/her job, and is that supervisor capable of on-job training his/her subordinates effectively so that they may arrive at a quality end product? In other words, do they work as members of a team to arrive at this quality product?

d. Does he/she get credit when credit is due?

The implementation of proper maintenance techniques and positive use of the human resources listed in the previous paragraphs together with the prevention of fogging and fungus growth is extremely important if one considers the costs of todays Fire Control System (FCS) components alone. For example, let us look at the cost of the Leopard C1 MBT Optical FCS instruments:

a. Sight Lead Computing with Laser Head (IFCS) $289,480.00.

b. Panoramic Telescope Commander's (TRP) $34,743.00,

c. Telescope, Articulating (TZF) $12,968.00.

d. Low Light Level Television PZB 200 (approx) $140.000.00.

From the foregoing paragraph we can surmise that preventive maintenance and in this case especially desiccation and pressurization is of utmost importance. These items must not be left to amateurs. "PREVENTIVE MAINTENANCE" not repair, is the professional technician's job. In other words why wait for a breakdown or deterioration to occur when it can be prevented by paying attention to preventive maintenance; it will pay off in the long run, both time and money wise.

THE TYPE OF DRY GAS USED FOR DESICCATION

The type of dry gas which is authorized for use in the CF is nitrogen. There are numerous types of nitrogen available through the supply system (over 50 in all), but there is only *one* type which is approved for use in optical systems. The dry nitrogen which is used to charge weapon recoil systems is *not* pure enough; it contains too much moisture and therefore promotes fungus growth. The *only* nitrogen authorized for use on optical systems is NSN 6830-21-883-0329, which is 99.998 percent pure, 5 part per million water and 3 parts per million oxygen, maximum. The bottle/container which must be used to store the nitrogen is NSN 8120-00-286-8592, and care must be taken not to interchange the weapon recoil charging nitrogen with the approved optical charging nitrogen.

The specifications of the approved nitrogen for optical use is G10-1 Type 1 Grade L, which is water pumped; it is available from:

Union Carbibe Canada Ltd
Gas Products 123 Eglington
Ave E Toronto, Ontario;
or its local representative.

When purchasing the nitrogen from a local representative care must be taken to ensure that the specifications are listed in the contract, otherwise a lower grade may be substituted. It should also be noted that the nitrogen bottle must be completely purged before it is refilled. Failure to do so will cause an accumulation of water which may be present from previous nitrogen fillings.

WHY PRESSURIZATION?

As discussed in paragraph 5, it is beneficial to desiccate and pressurize an optical system. Now let us discuss pressurization in more detail. The refractive index is a measure of the velocity of light in some medium as compared with the velocity in space, which is essentially a vacuum. If we consider air under normal atmospheric pressure of 15 PSI (Pounds Per Square Inch) we find that the refractive index for white light (which is a combination of all visible light colours) is 1.0003 and the density is proportional to pressure, then it can be readily concluded that the increase in index from 1.0000 to 1.0003 is the direct result of an increase in pressure from the vacuum, 0 PSIG (Pounds Per Square Inch Gage) to normal atmospheric pressure, 15 PSIG. We can therefore say that, for each pound of pressure increase, the index of refraction of air will increase by 0.0003/15 = 0.00002.

Without going into lengthy explanations or calculations let us now look at how this change affects the characteristics and functions of an optical system. Take for example a single lens element of crown glass with an Effective Focal Length (EFL) of 200 mm and a Back Focal Length (BFL) of 196 mm; see Figure 1 and 2. One of two pressurization conditions is likely to occur:

a. *Figure 1* – Only the cavity following the lens is pressurized; and

b. *Figure 2* – The volume both before and after the lens are pressurized.

The two foregoing examples are similar to the systems which we have in the Cdn Forces:

a. Example (a) above: C2A1 Sight Unit for mortars and a pair of Binoculars.

b. Example (b) above: TZF, C1 Telescope, Articulating, for the Leopard C1 and the Telescope, Elbow M118, for the M109 Howitzer.

If only the space following the lens is pressurized, figure 1, it will be found that the amount of focus shift, and indeed even the direction of focus shift, is a direct function of the lens shape. Since the second surface of the lens may cause convergence, divergence or no power at all, it follows that the increase in refractive index of the materiel will have no universal effect. Let us study the following figures and examples from paragraphs 14 and 15:

a. **Given:** Refractive index of air at 15 PSIG $\eta = 1.0003$
Refractive index of lens $\eta = 1.52$ (Crown glass)
EFL = 200 mm
BF = 196 mm

Question: What is the change in lens back focus when a pressure increase of 5 PSIG is applied to one side of the lens only?

Formula: $\Delta BF = 2 \cdot \Delta P \cdot F' \ (0.00002)$

Where: ΔBF = the change in lens back focus
ΔP = the pressure increase
F' = the focal length of the lens
0.00002 = the refractive index change per PSIG (see paragraph 14)

Answer: For the case of 5 PSIG pressure change the focus/image shift is:

$\Delta BF = 2 \times 5 \times 200 \ (0.00002)$
$\Delta BF = \textit{0.04 mm}$

If the pressure change is applied to both sides of the lens, figure 2, we find that the shape factor is no longer relevant and that the following will apply:

a. **Given:** Refractive index of the air at 15 PSIG $\eta = 1.0003$
Refractive index of lens $\eta = 1.52$ (Crown glass)
EFL = 200 mm
BF = 196 mm

Question: What is the change in lens back focus when a pressure increase of 5 PSIG is applied to both sides of the lens?

Formula: $\eta BF = 3 \cdot \Delta P \cdot F' \ (0.00002)$

Answer: The focus/image shift is:
$\Delta BF = 3 \times 5 \times 200 \ (0.00002)$
$\Delta BF = \textit{0.06 mm}$

Again both of the foregoing formulae apply only to simple elements of crown glass having an index of refraction of about 1.52, and the change of the EFL will be almost equal to the value found for the ΔBF. The above formulae remain fairly accurate when the lens becomes a cemented or airspaced doublet or triplet. However exact ray trace calculations should be made for critical applications.

THE RESULTING PARALLAX AND FOCUS ERRORS

Having determined the magnitude of the change in both back focus and effective focal length, it remains then to evaluate the impact that these will have on the functions of an optical instrument. The error due to pressurization may manifest itself in one of two ways. The system will become defocussed, or a parallax error will result between the target being viewed and the reticle within the instrument. In most observing instruments the defocus error is negligible because the human eye readily accommodates for errors of negative dioptric power. Notable exceptions of this accommodation of the eye would be long telescopes or periscopes which have long relay lens systems incorporated; for example the TZF, Articulating Telescope C1 for the Leopard C1 and the Elbow Telescope M118 for the M109 Howitzer. The cumulative effect of pressurization in such instruments must be compensated for during assembly, parallaxing, focussing the collimation. If a photographic or TV camera such as the PZB 200 night vision camera for the Leopard CI is to be adjusted, the problem becomes more critical, (no eye accommodation). These errors and solutions can be calculated and compensated for, which is usually done during manufacture, but it is up to the FCS technician to repair and collimate the optical system according to the manufacturer's specifications which includes pressure testing and desiccation.

For curiosity and more effective realization of the resulting parallax errors, let us calculate the corresponding ranges with respect to the back focus shift caused by a pressurization difference of the example in paragraph 18:

Given: EFL = 200 mm
BF = 196 mm
Change in back focus when an increase of 5 PSIG is applied is calculated as $\Delta BF = 0.06$ mm

The objective lens has been parallaxed at 1000 metres, and at 15 PSIG.

Calculated and basic known factors of optical practice

a. The image shift is 0.06 mm, the EFL plus shift is therefore 200.06 mm (S′);

b. When an optical system has been parallaxed at infinity, then the image of a target located at infinity will be focussed at the principle focal plane of the objective lens; i.e. the focal distance (S′) and the focal length (f) of the lens are equal;

c. When the inside pressure of the sight has changed, the statement in sub-paragraph b. above is no longer true. (See paragraph 18); and

d. Optical *sighting* instruments are normally parallaxed at a distance of 1000 metres (1 Km) and this is in practice considered as infinity; (this is not so for aerospace cameras and LASER alignment systems).

Question: At what distance from the optical system will no parallax be evident when the atmospheric pressure inside the optical cavity is increased from normal environment (15 PSIG) to 20 PSIG?

Formula: $\frac{1}{f} = \frac{1}{s} + \frac{1}{s'}$ were: f = Focal length
s = Object/target distance from the lens
s′ = Image distance from the lens

Answer: $\frac{1}{200} = \frac{1}{s} + \frac{1}{200.06}$ $\quad -\frac{1}{s} = -\frac{1}{200} + \frac{1}{200.06}$

$-\frac{1}{s} = -1.499551 \times 10^{-6}$ $\quad S = 666866.2819$ mm

S = *667* metres (approx)

From all the foregoing calculations we can conclude that when the referenced optical instrument is parallaxed or adjusted against a target at a distance of 1000 metres (while its cavity is subjected to 20 PSIG) there will be no parallax present during use at that range as long as this cavity pressure is maintained. When the inside pressure is now dropped to the same PSIG as the outside environment (15 PSIG) then parallax will occur at 1000 metre targets. None will be present at 667 metre targets, see figures 3, 4 and 5.

The foregoing calculations and facts are not that extremely important as far as simple optical instruments are concerned, because the human eye readily accommodates for small negative dioptric errors. It is, however, extremely important when the FCS technicians undertake repairs on costly opto-electronic night vision cameras such as the PZB 200 of the Leopard C1 MBT. When using the PZB 200 the user's eye is *not* part of the optical system and therefore does not accommodate for any errors which may be introduced by improper repair techniques. So take care, use the proper techniques as discussed and desiccate and pressurize each instrument according to its specification.

NEGLECT OF DESICCATION AND PRESSURIZATION TESTING

During our tours through various Cnd Forces repair facilities we have noticed that optical and electronic FCS technicians are paying little or no attention to the art of desiccation and pressure testing. This statement is further warranted when we personally checked over five dozen optical instruments at various locations within Canada and Europe, with each having the sealing or desiccating screws in tact with the original manufacturer's lacquer paint, although these instruments had been in service for over 9 years. This can be detected easily when using a magnifier or eyepiece of a telescope. It should be noted that some of instruments inspected were in Supply Depots, which would indicate that stores inspection and maintenance is not performed properly by Maintenance Units.

THE FREQUENCY OF PRESSURE TESTING AND DESICCATION

The normal frequency of pressure testing and desiccation of an optical instrument is 90 days, but should the desiccating gel in the cells change colour more frequently, or should fogging of the instrument occur, then this frequency may be increased by the Unit Commander. Now don't think that the Unit Commander has the time to check each and every sight within his Unit, it's up to the Maintainer, which is "YOU" the professional, who has to enforce the preventive maintenance procedures. A decrease in time required for the silica gel to change from purple/blue to pink/white indicates that there is a leak in the system, and the instrument must therefore be pressure tested and the leak located and sealed. Failure to do so will cause a decrease in the sight's performance and thus the complete weapon system will be degrated. It will also cause permanent damage to the optical and mechanical components within the system; in the form of fungus or oxidation. For procedures and frequency of desiccation, purging and charging of fire control instruments see paragraph 1-3, section 1 of TM 750-116, and CFTO C-66-171-000/MB-000.

CONCLUSION

As discussed, desiccation, pressurization and proper repair techniques together with the proper attitude will produce a quality product. One reason as to why it is so hard for FCS technicians to accept all of the

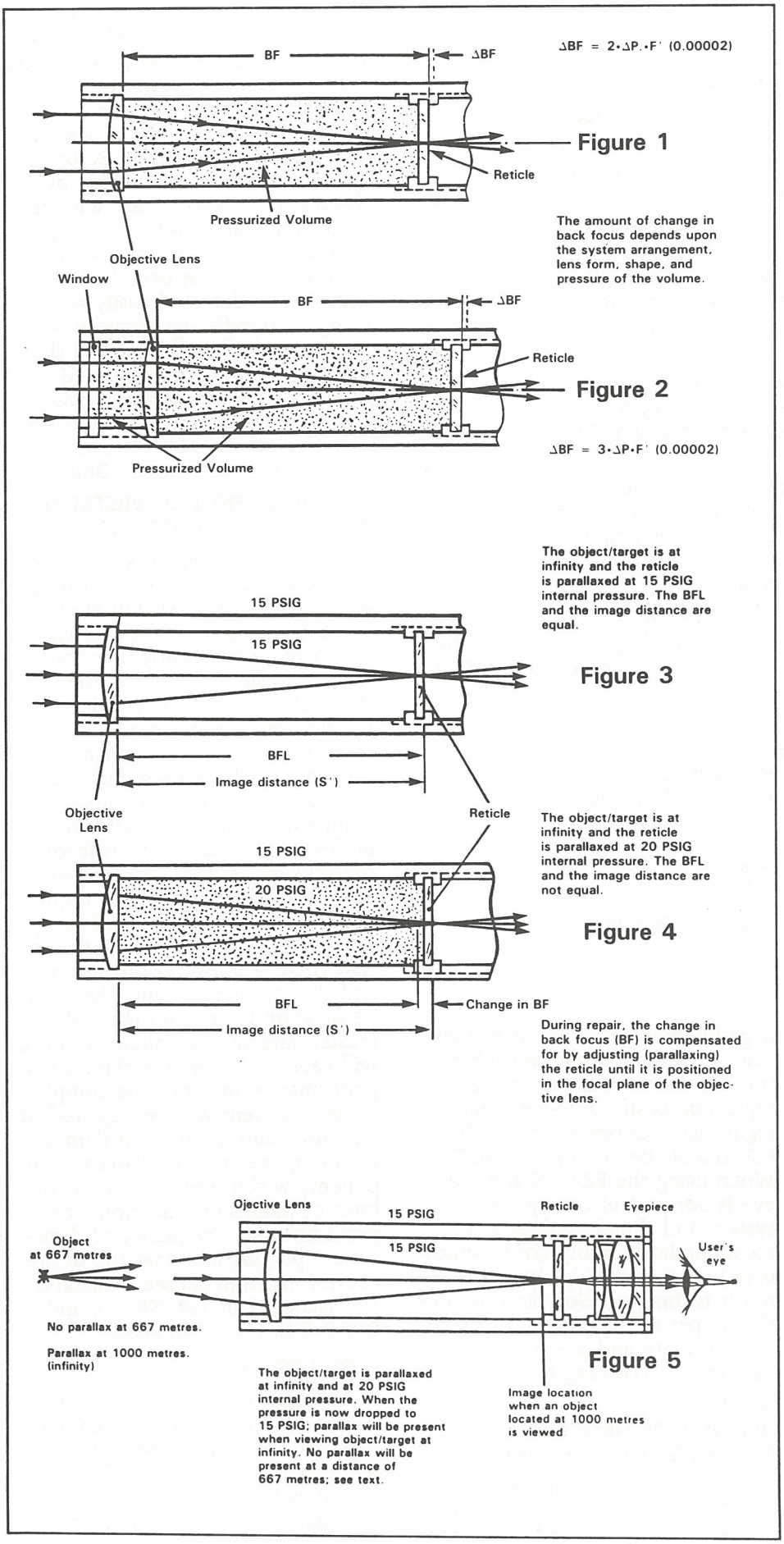


Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

aforementioned facts is that they are not readily apparent before the completed optical instrument is returned to the Unit. But when the rules ar not adhered to, rapid deterioration will follow. The sum-up remember this important slogan: "IF PREVENTIVE MAINTENANCE IS PERFORMED AT REGULAR INTERVALS, LITTLE OR NO REPAIRS WILL BE NECESSARY IN THE FUTURE" and we can all spend our time doing more exciting things such as Curling, Fishing or other Sports on a Sports afternoon. Remember we are the professionals, let us all act and live up to it!

– ARTE ET MARTE –

LEME Spectrometric Oil Analysis Program (SOAP)

The SOA Program currently being used to monitor the Leopard C1 engine and transmission components has resulted in an increase of component life prior to rebuild, with some engines with over 1000 hours of operation exhibiting no signs of upcoming failures. The program has also reduced the number of oil changes, resulting in considerable oil and manpower savings.

Over 2000 oil samples have been analysed since the commencement of the program and the results have indicated that oil contamination, a major cause of component failure, has developed into a major problem. Contaminants such as dirt, sand, antifreeze, fuel and water were found in large quantities.

The LEME SOA Program has been expanded to include Leopard engines, transmissions and hydraulics; M109/M578 engines, transmissions and hydraulics; 20 AVGP engines and a number of miscellaneous vehicles such as the BV206.

As a maintenance tool, SOA can provide an accurate indication of the internal condition of an assembly. To be of benefit, samples must be properly taken and they must be promptly sent for analysis. Unit feedback is also a vital link in the program if it is to be used as a maintenance tool. A proper SOAP can save the Canadian Armed Forces money and will lead to the elimination of unnecessary oil changes by the user.

DCGEM Update

Personal Body Armour System

The Fragmentation Protective Vest

INTRODUCTION

The protective vest currently used by the Canadian Forces (CF) is an early US army model made with ballistic nylon fabric. It is heavy, bulky and very restrictive to movement. It was taken into service in 1970 for personnel involved in internal security tasks. New fibres lead to lighter and less bulky fabric replacing the ballistic nylon in protective vests. Prompted by these technological advances, and the analyses of wound statistics of Vietnam and the Israeli Middle East experiences (which confirmed that wearing protective vests and helmets significantly reduced battle casualties and increased morale) the CF, in the early 1980's, elected to provide Fragmentation Protective Vests (FPV) for its NATO assigned forces. This was to reduce potential casualty levels from fragmentation munitions and thus enhance the sustainability capability of the forces.

As a preliminary development activity, several FPV variants of different national origins were procured in 1984 for user evaluation. The purposes of this evaluation were to determine design features for a CF vest and to ascertain whether an available design would meet our needs. The results of this trial revealed that while no vest was fully acceptable some had acceptable individual features. A major factor contributing to this result was that the CF load carrying equipment and combat clothing are of distinctive design and the trialled vests were designed for compatibility with the gear of other national forces. However, the subjective user opinions from this trial regarding wearer comfort and equipment compatibility influenced the determination of such design features as weight, shell fabric, vest configuration, irritation points, sizing and method of wear. Separate trials established the required level of ballistic protection, the V50 BL(P) (or V50 as it is more commonly known). Thus the following performance requirements were established:

a. *Weight.* The weight of the medium size, regular length FPV is not to exceed four (4) kilograms;

b. *Ballistic Level of Protection.* The minimum acceptable V50 is 480 metres per second, when the FPV is subjected to a challenge by the 17 grain fragment simulating projectile in the manner described in the NATO Standardization Agreement (STANAG) 2920, "Ballistic Test Method for Personal Armour";

c. *Flexibility.* The garment must cause minimal interference with the performance of combat tasks; and

d. *Compatibility.* The FPV must be designed to be compatible with the helmet, individual and crew served weapons, communications equipment, load carrying equipment and CW clothing.

DEVELOPMENT

Because fabric armour technology, by this time, was relatively mature and Canadian firms had a measure of experience in weaving ballistic fabrics, it was decided to turn to industry for the development of the Canadian FPV. Using the information gained from the preliminary trial of other nations' protective vests and the guidance offered by STANAG 2911, "Design Criteria for Fragmentation Protective Body Armour", a two phase project was raised in Jul 1985 to design and develop a FPV for the CF. This involved the development of a suitable ballistic material and the design of a garment whose style, comfort and utility would make it acceptable to the troops in the field.

Ballistic Material Development. This involved the analysis of samples of existing ballistic fabrics and determination of the physical properties of the fabric that best met our needs. The primary factors guiding the fabric development were the requirements for a maximum weight of 4 kilograms, a V50 of 480 metres per second and the requirement for a flexible fabric. Preliminary trial results had already defined the configuration of the FPV and it was decided to use an in-service material as the shell fabric. This, together with the weights of the incidental fabrics and findings, determined from an FPV mock-up, allowed the calculation of the maximum weight available for the ballistic fabric to meet the required V50. Various ballistic fabric constructions were produced and shoot-packs prepared and ballistically tested in both wet and dry states. Ultimately, a weave and fabrication process was established that met the three basic performance requirements. A limited production run of material then followed to prove the fabric formulation and manufacturing process. In addition, to prove that adequate information was contained in the fabric specification to allow successful manufacture of a fabric with the required ballistic characteristics and to ensure industrial reproduceability, the specification was provided to an independent contractor for production. The resultant material met all performance requirements.

Development of FPV. The contractor who produced the ballistic fabric was also experienced in the manufacture of ballistic garments and was tasked with the development and production of a prototype FPV, using the fabric already manufactured as Government Supplied Material (GSM). The work associated with this task was:

a. the preparation of a Technical Data Package (TDP), which would include all the documentation necessary to define the technical requirements that must be communicated to a competent contractor to permit him to provide a technically correct FPV. As a minimum, this would include a step-by-step construction method, quality assurance provisions for inspection, scale of measurement, data to govern the

manufacture of the ballistic material, production drawings and paper patterns; and

b. the production of sample vests to prove the production process. The best examples of these sample vests would be used as "sealed patterns" for use in the procurement process, and the remainder would be used for trials.

Work on the two phases of the FPV development was conducted simultaneously. Non-ballistic prototype vests were prepared during the fabric development phase to the basic design determined from the user evaluation. This design was refined by professional tailoring staff to optimize comfort, relieve irritation points, improve ventilation, reduce material "bunching" and prepare graded paper patterns. By the time the fabric was developed and a quantity of material was produced, the design for the prototype vest was completed. A quantity of vests was produced in 4 sizes and two lengths and the manufacturing process was established. The vests subjected to user evaluation to confirm the design. These evaluations gave rise to minor modifications which were incorporated in the sealed patterns (actual sample vests) and the design was "frozen". This freezing of the design allowed the contractor to make final adjustments to the remainder of the TDP, which when delivered, signified the completion of the development phase of the Fragmentation Protective Vest.

TRANSITION — DEVELOPMENT TO PROCUREMENT

With the delivery of the technical data, trial vests and sealed patterns from the contractor, the requirements to put this information into a formal acceptable to DND was addressed as follows:

a. the FPV specification required formatting to ensure that — the basic performance requirements were emphasized; the construction and configuration, which evolved through user trials, was adequately described; and that the door was left open for advances in technology that would allow product improvement and/or new materials to be eligible for consideration;

b. the technical information and drawings provided from the contractor were translated into production drawings in accordance with departmental specifications; and

c. the procurement approach was examined from two aspects — one which would allow bidding on the two major phases of manufacture, ie, the fabric production and the cut, make, trim and assembly of the vest with the fabric supplied as GSM; and the prime contractor approach, which would allow single source bidding only. It was decided that the prime contractor approach would be more appropriate in this case since it would ensure the highest standard of quality control and the most expeditious means of manufacturing by assigning to one source the responsibility for the qualitative and financial aspects of producing the finished product.

At the time of writing (Dec 88) all the data necessary for a competent contractor experienced in working with ballistic material to manufacture a fragmentation protective vest to CF requirements had been assembled and the procurement instrument (Contract Demand) had been prepared. The Request For Proposal (RFP) was released to industry and responses were expected to lead to contract award by May 89 with first deliveries commencing in the second half of the year.

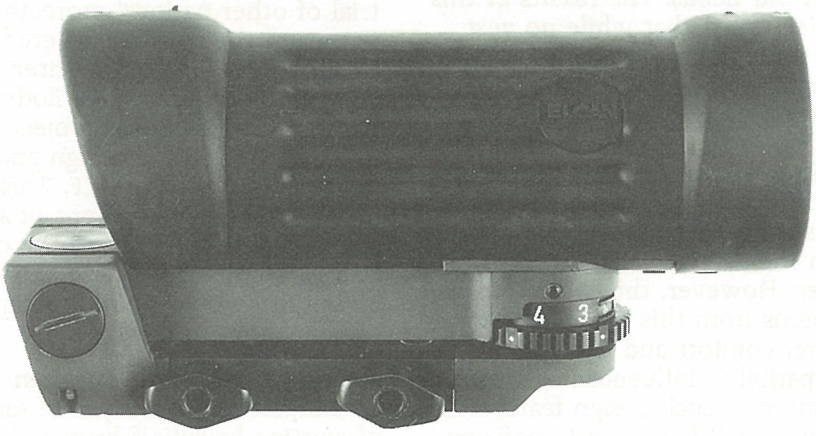
PMO SARP

The Never Ending Story

Small Arms Optical Sights

Over 20 years ago, an Operational Equipment Requirement was approved for a small arms weapons sight. At the time, the reason for the requirement was that standard iron sights were increasingly difficult to see and align on the target in poor light conditions. Active infra-red and image intensifier sights were too expensive. In effect, it was to be a "poor man's night sight," capable of being fitted to rifles and machine guns.

The characteristics required no adverse effect on the weapon, compatibility with various clothing and equipment, easy zeroing, robustness and light weight. However, there were two characteristics which led



C9 LMG with optical sight.

to considerable difficulties over the years. The first was that the sight had to be moved easily between weapons. The second was that the sight need no maintenance other than normal cleaning by the user, and that it remain serviceable without need for repair for the same period as the weapon to which it was attached. Neither criterion was clearly described, and over the intervening years there were many interpretations. For example, the maintenance requirement was officially clarified to the extent that "no manpower increases must be necessary because of the introduction of equipment". As an example of one extreme, the easy movement between weapons was actually considered in the scenario of an LMG gunner breaking his sight as he jumped from the back of 2-1/2 ton. A rifleman in his section was expected to be able to remove the sight from his rifle and pass it to the gunner who would then replace his broken sight virtually before his feet hit the ground!

When the project started, it was handled in NDHQ by the predecessors of the Director of Land Requirements (DLR) and the Director of Land Armament and Electronics Engineering and Maintenance (DLAEEM). Leitz Canada of Midland, Ontario, was chosen as the developer, and the human engineering specialists of the Defence and Civil Institute for Environmental Medicine were asked to recommend essential characteristics. DCIEM evaluated a variety of optical sights characteristics, such as size, magnification, light gathering power under low light conditions and reticle patterns. Their recommendation was approximately a four power magnification sight as larger magnification sights were either too heavy or too restricted in field of view. DCIEM evaluated twelve proposed reticle patterns for easy of visibility at night. They recommended four as having acceptable characteristics, from which the one being used in sight development today was chosen as most suitable for an average soldier. Note this very important point. The sight is intended as a combat sight for the average soldier, not for those who can choose which eye of the moving gnat they hit at 1000 metres. For manufacturing reasons, the magnification of the sight was chosen to be 3-1/2 power.

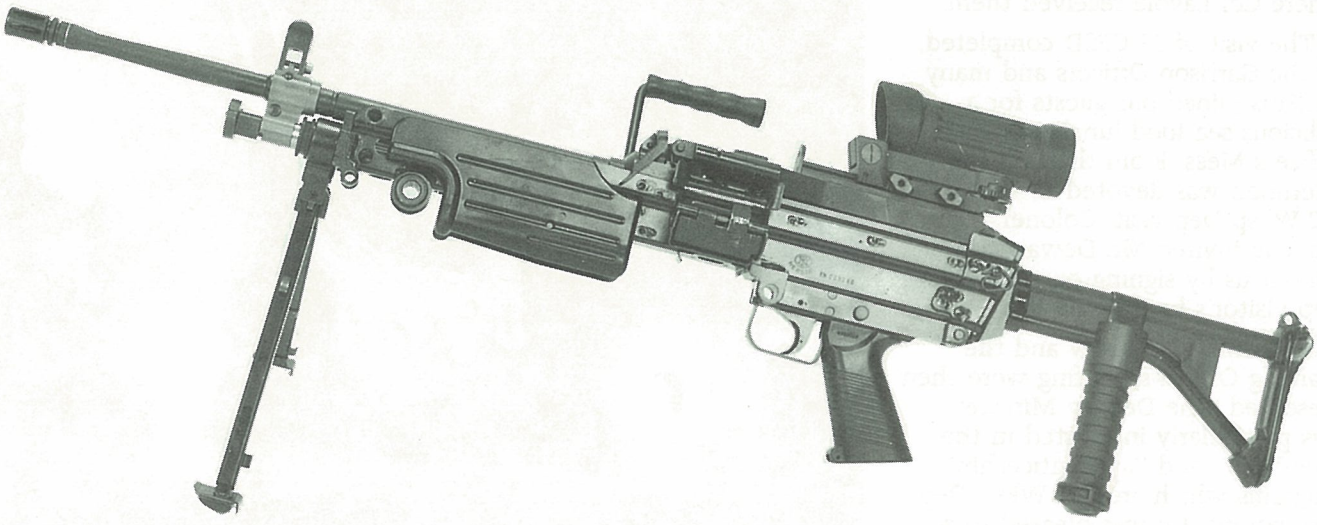
Development continued up to 1976. Some trials with prototypes were held which proved the concept. Other nations were also developing sights and when money became available for an opportunity buy, it was proposed to procure one of these. For domestic considerations this did not take place and, in 1976, the project was shelved because of lack of funds.

In 1979 the project was reactivated to produce limited quantities to meet an operational deficiency identified by CFE. It was found that the sight could not be introduced until after approval of the SARP project because the addition of optical sight compatibility as a factor in the SARP competition would have caused undesirable delay. Thus the two projects (SARP and the optical sight) continued to be handled separately.

In late 1985, formal optical sight trials were held at CFB Valcartier as part of the C9 LMG service introduction trials. It was demonstrated that the prototype sight improved weapon performance at dawn and dusk, and also improved the daylight capability of the LMG at longer ranges. It also demonstrated conclusively that the sight was much too fragile for field use. These results were confirmed in a test using the C7 rifle in April 1986.

Formal staffing of the requirement and financial documentation continued. As the sight was a separate project, DLAEEM was technical authority with SARP being only a very interested onlooker. In 1986, DLAEEM simplified the organizational relationship by having SARP become the technical authority on the sight. In the summer of 1986, the entire optical sight project was blended into SARP.

Leitz was already attempting to make some changes to the 1985 sight to improve durability, but the split in project responsibility had



C7 with optical sight compared to standard C7 rifle.

made it difficult to adjust the requirement to conform to technical reality. Leitz presented DND with a revised model in April 1987, but it still did not meet the durability requirements. As a result DND re-evaluated the characteristics stated in the 1968 OER and redefined some of the requirements. The overriding requirement was for durability (defined as being dropped sight-down under a C9 LMG). The sight unit was to be completely sealed. The quick change between weapons was eased to 10-15 seconds using no tools. Zeroing was specified as 1/4 mil in azimuth and elevation, and ranging characteristics were defined as 200 to 800 metres. Rifle and LMG sights were to be identical for logistics simplicity, even though the range adjustment was not absolutely necessary for rifle use.

After considerable testing and much interaction with SARP, Leitz presented their new prototypes in July 1988. Testing has been conducted at QETE and at Trials and Evaluation Section at Gagetown. The new prototype sight passed all its durability trials with flying colours and was well received by the troops involved. It did well in engineering trials. The Gagetown user trial noted some weak areas which need to be addressed, such as interference with other equipment (helmets and laser filter goggles).

At the time of writing, the trial results are being evaluated and staffed. Once the necessary decisions and engineering changes are made, the optical sight will be prepared for production and, hopefully, in the hands of troops before its silver anniversary in 1992.

202 Workshop Depot

The National Defence Deputy Minister Visits 202 Workshop Depot

Under a beautiful fall sky, last November 14th, the National Defence Deputy Minister, Mr. Dewar, and his Cabinet Chief Mr. Denis Henrie, visited 202 Workshop Depot (202 Wksp Dep) as well as 25 Canadian Forces Supply Depot (25 CFSD). They were first welcomed at the Officers Mess by Col Marleau, CO of 202 Wksp Dep, Col Lavoie, Co of 25 CFSD, Col Corley, the Base Commander and Maj Marchand, the Longue Pointe Garrison Commander. Major Dubois, the President of the Officer's Mess Committee, took the opportunity to make a presentation.

Shortly after, the Deputy Minister and his entourage drove to Patrick Building for the visit of 25 CFSD where Col Lavoie received them.

The visit of 25 CFSD completed, all the Garrison Officers and many civilians joined our guests for a delicious sea food luncheon at the Officers Mess. From then on the afternoon was devoted to the 202 Wksp Dep visit. Colonel Marleau invited Mr. Dewar to honour us by signing our 202 Wksp Dep visitor's book.

The Unit slide show and the Training Officer's briefing were then presented. The Deputy Minister was particularly interested in the "Get-Well" and "apprenticeship" programs which are 202 Wksp Dep innovations. He was pleased to see the attention put of training of civilian personnel.

Mr. Caissie demonstrates the extensive damage that EQPT can sometimes endure

The tour then carried on in the computer installations where the Deputy Minister was concerned with the reactions of employees to a computerized work environment. The reactions were quite varied add Mr. Goyette, the Management Information Systems Officer, informed him, they ranged from distrust to enthousiastic acceptance. While walking through the new Engineering Services Division set-up Mr. Dewar appreciated it's modern look. In the drafting room, he witnessed a demonstration of the computer aided design system.

Driven to building #3, to the vehicle and Armament Division, the Deputy Minister was welcome by the Division Officer, Mr. Hardy. Mr. Hardy explained with pride the planning and control process necessary to sustain the large repair and overhaul projects found in building #3. Mr. Dewar had the opportunity to see both major projects on the line; the APC Product Improvement program in its terminal phase and the Leopard Program newly started up.

At the mechanical division, Mr. Dewar receives a demonstration of a numerically controlled machine by Mr. Ratté

Our guest was surprised to see that on top of this considerable workload 202 Wksp Dep is also occasionally tasked to repair naval armament such as the 3 inch 50 presently on the premises.

In building #10, Mr. Dewar, accompanied by the Mechanical Division Officer, Mr. Caissie, received a demonstration of the capabilities of a numerical control machine, observed the work going on for installation of the huge new milling machine, and was surprised of the extent of the work being undertaken by the Division. Mr. Caissie also showed him a number of ruined pistons from different motors destroyed because of lack of oil or misuse.

At the Electrical Division, Maj Lajoie, The Division Officer, continued the tour. The Deputy Minister was able to observe special installations such as the dust-free optronics lab, the radar repair shop and the Leopard control panel test equipment.

After this rapid tour, the production divisions coffee was had with 202 Wksp Dep upper management and union representatives. The CO took the occasion to present our

Mr. Dewar is interested by Mr. Mulroney's explanation of the work in the hydraulics shop

guest of honour with a commemorative plaque.

The last hour of this hectic day was spent as an exchange between the Deputy Minister and our CO.

This was the first time a National Defence Deputy Minister ever visited the depots of the Longue Pointe Garrison, but Mr. Dewar said that, he thoroughly enjoyed his visit and will recommend to his successor to come and see for themselves the activities of these two depots.

Lt. Y.M. Bergeron

Using the model of building 3, Mr. Hardy explains the production mechanism in the vehicle and armament division.

LETE Update

LETE Indoor Test Firing Range

In the early 1980s, LETE indentified a requirement for an indoor test firing range in which to conduct tests on the functional characteristics of small and medium calibre land force armaments.

The range was commissioned in 1988. It has the following features:

a. Two designated firing positions. The first, a gun room for firing weapons from fixed mounts. The second, a vehicle/turret firing position capable of allowing vehicles as large as the Leopard MBT or the M109 SP, to be located inside the facility;

b. Distance from firing point to target of at least 100 metres from any of the designated firing positions;

c. Capability of handling up to and including 40 mm ammunition;

d. Environmental control to provide constant conditions throughout a trial;

e. Ventilation, noise control, and ricochet suppression systems;

f. An overhead crane capable of suspending target arrays weighing up to 1.5 tons and remotely adjustable for distance throughout the length of the range;

g. Video system for recording terminal effects and weapon functioning. Digitized prints can be instantly produced from individual video frames for inclusion into reports.

The LETE indoor test firing range has the following specialized equipment installed;

a. *Epson AT-compatible computer.* LETE developed software controls all instrumentation and weapon firing. Data collected by the computer includes shot rate, velocity, shot position, and number of rounds fired. Statistical analysis is displayed immediately upon completion of the firing cycle. The data is automatically stored on diskette for further data analysis as required;

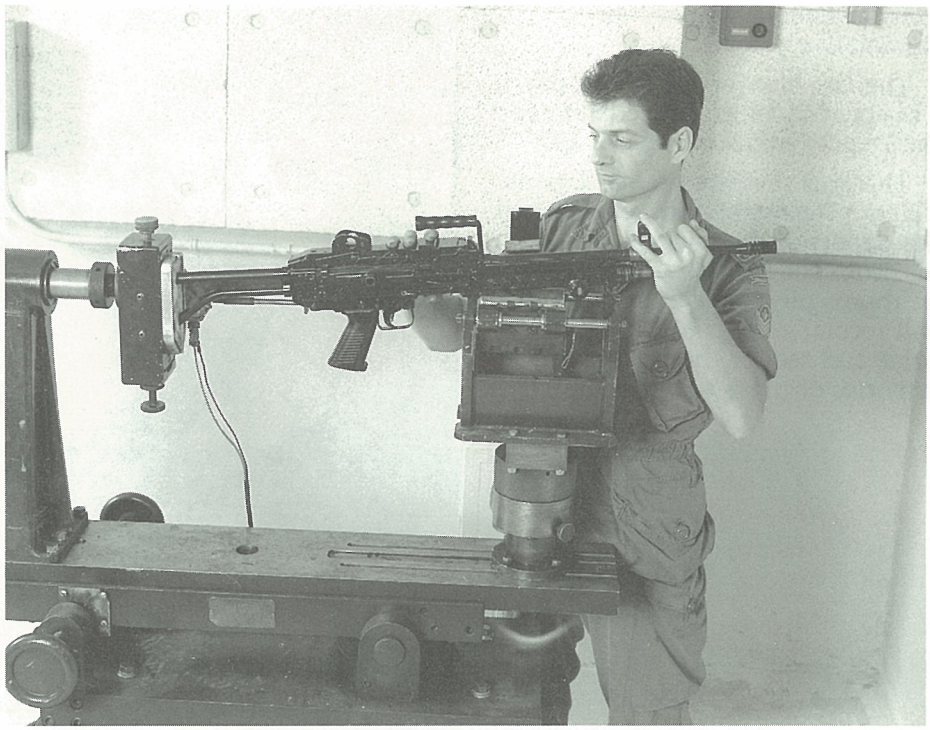
b. *Gilda Precision Mount.* This mount was designed in the UK in support of the NATO New Family of Small Arms. It is a fixed mount capable of returning the weapon to the same point of aim following each shot. Both 5.56 and 7.62 mm weapons firing single shot or automatic (up to 1200 rpm) may be used;

c. *LETE Soft Recoil Mount.* The mount has been designed to safely secure a weapon for single round or burst firing without returning it to the same point of aim. It is used for endurance firings to induce barrel wear;

d. *Accubar Shot Position Indicator.* The Accubar system is a highly accurate electronic target capable of measuring the position of supersonic projectiles to

within 1 mm at 100 m. Position of the projectile in x and y coordinates is transmitted to the indicator's sensing rods by the projectile's shock wave; and

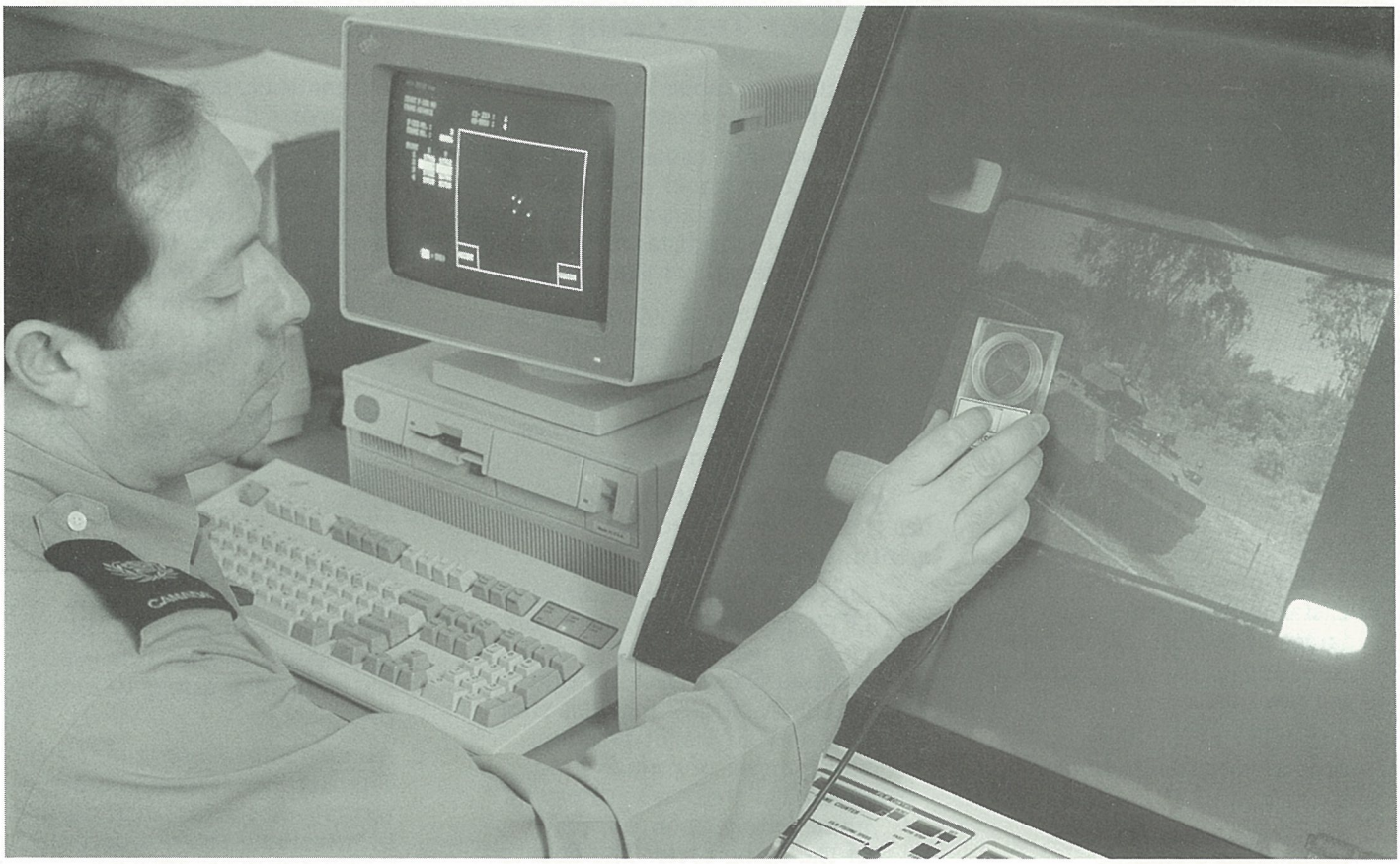
e. *Velocity Screen System.* Two pairs of screens, made by Electronic Counters Inc., are used to determine the elapsed time required for a projectile to pass between a set distance. The AT computer displays the elapsed time as an observed velocity representing the velocity of the projectile at mid-point between the screens.



Sgt Rosebush secures the C9 in the Gilda Precision mount.

A Motion Analyzer in LETE

The Photo Section of the Land Engineering Test Establishment (LETE) has recently taken delivery of a new system which considerably enhances its capability to support engineering tests. The Motion Analyzer, produced by NAC Incorporated of Japan, consists of two digitizer screens designed for



MWO Berger plots motion analysis data from high speed video film.

16mm and 35mm films. It uses a high quality stepping film projector to project an image on the back of the translucent digitizer screen on a frame by frame basis. Alternatively, single still shots such as standard 35mm slides can be inserted one at a time. Once the image is displayed on the screen, a number of measurement modes are possible through the IBM PS/2 Model 50 computer which controls, acquires an analyzes the data points which are selected through the movement of a cursor on the screen.

On any displayed image, the operator can perform length, angle and area (LAA) measurements, and display the data both numerically and graphically on the computer screen using the standard MOVIAS system software. Additionally the collected data points can be stored to disk and transferred to third party or user software for any required unique and specialized processing. The measurement system is easily calibrated by ensuring that a known length is captured by the camera at the distance of interest. The user simply enters the two measured data points along with the length between these points and the computer automatically calibrates all distances to this reference.

The LAA mode of operation has proven itself in a number of LETE engineering projects. For instance, the turning circle of a vehicle was recently determined by using a 35mm camera with a motor drive to produce slides which were analyzed on the NAC system. In another case, a quick study of the clearances required in an engine test stand being designed by LETE was performed by photographing the different engines and assessing the measured envelopes to directly observe interference problems. In an upcoming project the system will be used to determine vehicle body roll angle in dynamic maneuvers thereby providing a quantitative measurement of handling. The area measurement has also been extremely beneficial in such tests as measuring windshield defroster patterns and rates and in determining frontal areas of vehicles for use in calculating vehicle wind resistance.

Of most benefits, however, is the ability of the system to use high speed photography to analyze dynamic events in slow motion. This capability has numerous

Cpl Lavalee taking high speed video coverage of an APC on the concrete sine wave course.

applications in both vehicle and weapons engineering. LETE currently has an ongoing program to validate the Nato Reference Mobility Model (NRMM) for a number of combat vehicles. This computer model makes predictions on the dynamic performance of vehicles based upon a large number of vehicle parameters. One of the outputs for instance, predicts the response of the vehicle and its suspension to an obstacle of known shape and size.

In the field validation trials, high speed cinematography is used to focus on the obstacle so that the exact displacement of the road wheels and vehicle centre of gravity are captured. The test results can then be compared to those predicted by the model to assess its accuracy. In the past, such displacement data had to be calculated by performing double integration on accelerometer measurements with a corresponding degradation in precision. With better precision of measurement it is hoped that computer models such as the NRMM can be improved to the point where a good deal of confidence can be placed in computer simulated testing.

The NAC system does have one disadvantage. Since it uses photographic film as the recording media, delays between testing and analysis are inevitable. In the case of cinematography, where the processing of film must be contracted out, these delays can be substantial. As a result, LETE is currently investigating video technology for use in a parallel system. Although video systems offer less image resolution they are ideal for situations where quick look data in the field and rapid analysis are essential.

The motion analyzer system has resulted in a substantial step forward in engineering measurement capability at LETE and new applications for the equipment are always arising. By continuing to expand its capabilities in ways such as this, LETE hopes to continue to improve its ability to perform a thorough and professional job for its clients.

D.S. Christensen
Senior Instrumentation Engineer

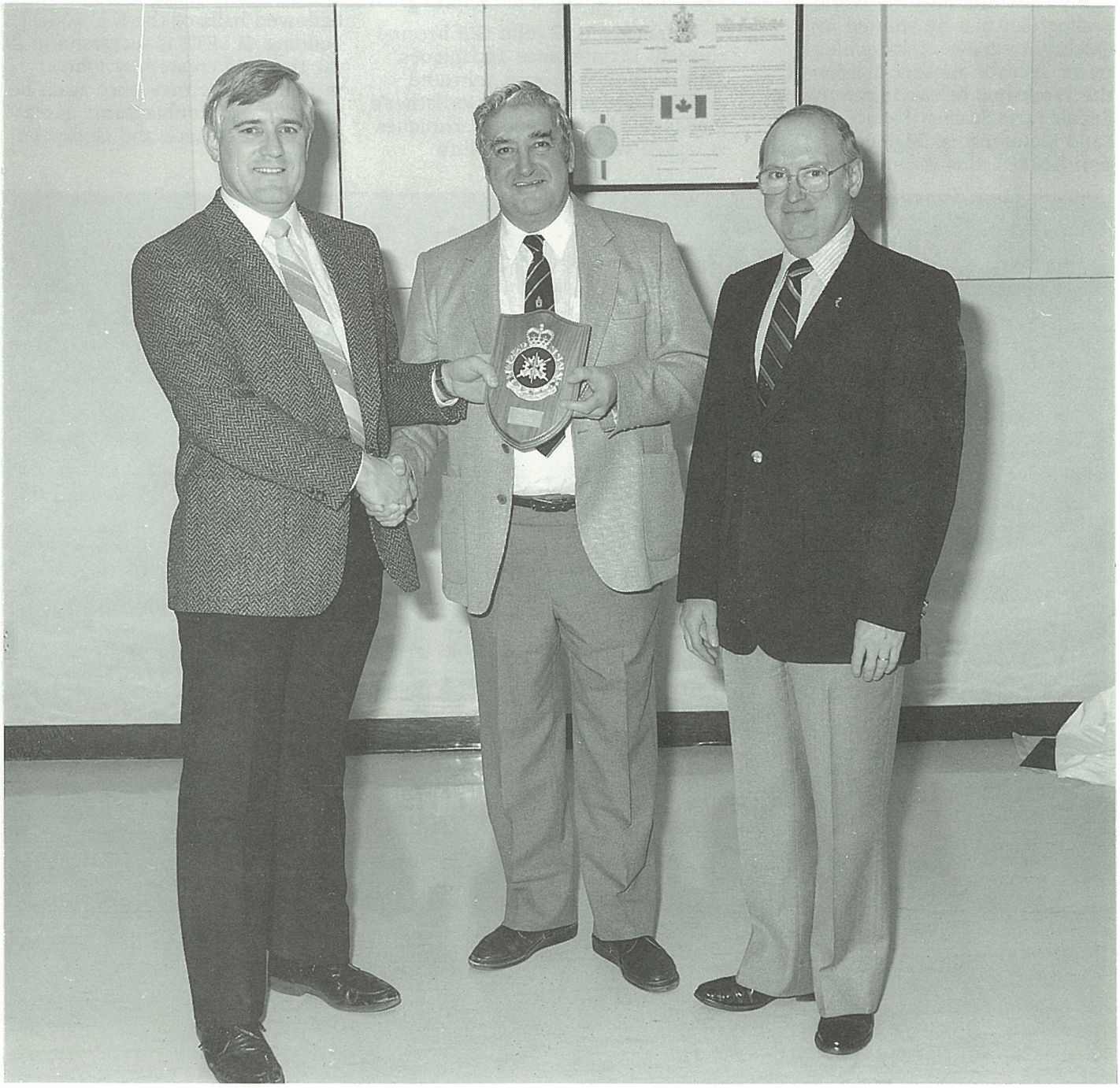
John Gill Retires

LCol Hyttenrauch presents John Gill with his certificate of 43 years dedicated service. Maj G.J. Koeller and Maj. R. Turmell congratulate.

This past November marks the closing of a chapter in EME and LETE history with the retirement of John "Godfather" Gill after Forty Three years of dedicated service to Canada, the Canadian Army and the Civil Service.

John Gill, formerly of 33 Spring Street, St. John, New Brunswick joined the Canadian Merchant Navy (BADGE Number 7380, ID Certificate Number 31422) as a Radio Officer 3rd Class during World War II. John was promoted several times through to the position of 1st Radio Officer. Though being the senior Communication Officer, he also did the duties of navigation, gunnery and the paymaster. John served on many ships during his time in the Merchant Navy, among them was the Wildwood Park, Quetico Park, Rockland Park and the Waverly Park. John's affection for the name Park is so ingrained that he has to live in Greenfield Park, on the south shore of Montreal. These vessels took him from the mundane city of Halifax, to Vancouver, Portland and the exotic location of Balboa.

For these journeys John H. Gill was awarded the 1939-45 Star, 1939-45 War Medal and the Pacific Star on 15 September 1950 by the Canadian Army, (Where was the Navy!). In 1946 John left the Merchant Navy to join the less stressful existence of civilian life. Between 1946 and 48 John was a telephone technician for "Old Ma Bell" and a Radio/Navigation Officer for many transatlantic flights.



(L to R) Maj R.H. Turmel, Mr. John Gill, Maj G.J. Koeller (DCO).

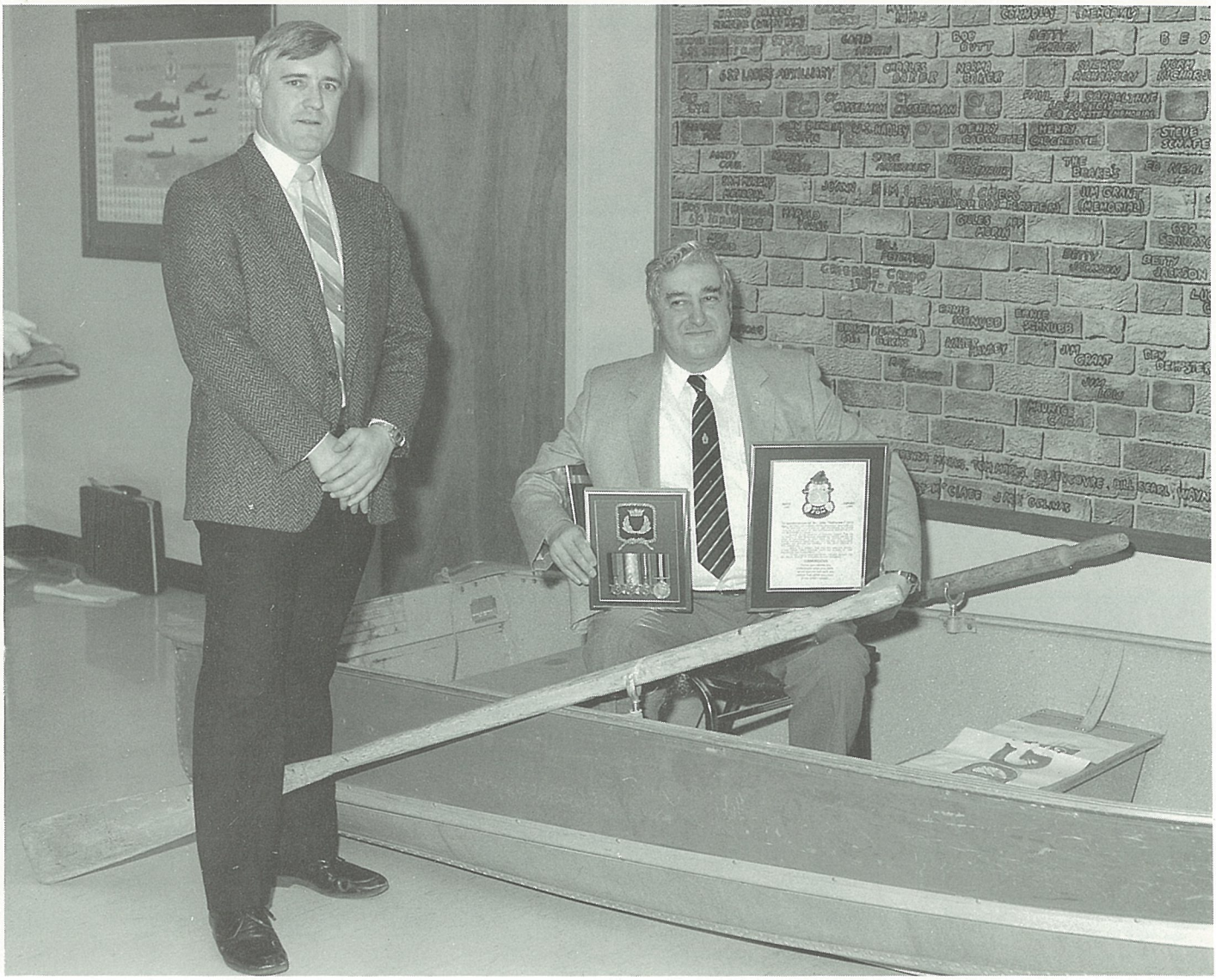
Missing the camaraderie of a service life, and recognizing the error of his ways he joined the Royal Canadian Electrical and Mechanical Engineers (RCEME) as a Electronic Technician. While soldiering on John became very involved with First, Second and Third Line Maintenance of electronic equipment. John must have found his "raison d'être" because he left the military half of RCEME and joined the civilian side of the corps.

Now that he was a civilian at 202 Work Shop Depot, his career eventually took him into the world of Scaling. But first he worked in Quality Assurance, testing electronic gear for another division of the Workshop before transfering to Repair Parts Scaling (Radar), of the Land Maintenance Engineering Division (LMED), this is forerunner of the present R+M Squadron (LETE). In 1968 John became the Supervisor for Repair Parts Scaling (RPS) Radar, during which time he served as Acting OIC RPS on many occasions.

John took a transfer within LMED and was promoted to OIC Information Services Data Link Analysis. This group developed, wrote, and monitored the Automated Data Processing (ADP) programmes involved with the Capital Acquisition Programmes. Other areas of involvement included usage of data, maximization of resources, training and recruiting.

In January 1982 John Gill became the OIC Maintenance Techniques. This division was born, nurtured and matured under the "Godfather's guidance". Maintenance Techniques is tasked with maintainability evaluation on all (old & new) army equipment, design & development, technical manual validation, maintenance proceedures, and battlefield damage repair. One of John's pets was the growth of Battlefield Damage Repair (BDR) to the point where consideration is being given to making BDR techniques a published document. This is an indication of the growing importance and awareness of the BDR within the EME world.

The Godfather's Highland pipemusic and Maritime philosophy will be sorely missed around the hallowed halls of the K.J. Rodger's Building. If LETE is successful in filling the void created by John's retirement, we may once again be blessed with Robbie Burns quotations. Best of Luck and Godspeed John!



John Gill showing his "Naval Pride" with Maj Turmel (OC R&M) to left. In John's right hand is the R&M Sqn Departure Scroll.